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ABSTRACT

To assist in its mission of providing information in the most timely manner, the National Center for Education Statistics (NCES) contracted for a study of current modes of information dissemination to its user population that would also identify new and emerging technologies for information dissemination. The project is divided into three phases of information collection activities. Phase 1 entails analyzing current information dissemination. Phase 2 explores new or emerging technologies. Phase 3 includes user requirements analysis. In general, NCES users are satisfied with the quality of NCES information, but want to be more informed about product offerings and want more timely access to NCES information. The end-user interface is the weak link in the Federal Government's program of providing statistical information about education in the United States. Otherwise, the NCES serves its pluralistic constituency well, packaging its information in a variety of formats and product types and delivering them in a variety of ways via current technology. Weaknesses are in the areas of timeliness, delivery targeting, and user awareness. Recommendations are presented mainly in the area of enhanced technology utilization. Seven figures illustrate the report. An appendix contains six illustrative figures. (SLD)

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ED360319

NATIONAL CENTER FOR EDUCATION STATISTICS

"PRODUCT PLANNING AND DEVELOPMENT"

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

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FINAL REPORT

March 13, 1992

Prepared By:

User Technology Associates, Inc.
Under Contract RN91062001

USER TECHNOLOGY ASSOCIATES, INC.

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EXECUTIVE SUMMARY

The National Center for Education Statistics is responsible for acquiring and diffusing, among the people of the United States, useful statistical information on subjects connected with education. To satisfy its charter, NCES generates statistics in a variety of formats and transmits such information utilizing various means and media. In an effort to provide information in the most timely manner, while providing the highest user accessibility and flexibility, NCES has identified the need to analyze the current modes of information dissemination to its user population. This analysis includes research into new and emerging technologies which may be useful now and in the future. The purpose of this project is to identify new options for information delivery and to provide recommendations to better serve the diverse NCES user population. The project is broken into three phases of information collection activities.

Phase I entails analyzing what is currently being done with regard to dissemination of information by NCES, other Government Agencies, and the private sector. Information gathered throughout the execution of this project indicates that NCES is providing service to its pluralistic user community by offering varied statistical products via diverse dissemination methods. NCES ranks in the upper third among other government agencies interviewed with regard to dissemination technologies utilized. In addition, it was found that the private sector is heavily marketing products and services for electronic transfer of information.

Phase II explores new or emerging technologies which may be applicable to NCES information delivery requirements. Predictions indicate a trend toward transparent networks, and optical disc solutions. Projections of the future include world interconnectivity via increasing use of wide area networks or supernetworks.

Phase III includes a user requirements analysis for NCES data in terms of format, media, and means of dissemination. Results of the user study included:

- Refinement in the definition of the NCES user community.
- A lack of user awareness and product accessibility.
- A need for timeliness, monitoring and evaluation of product offerings, and user training.

In general, NCES users are satisfied with the quality of NCES information, but want to be more informed about NCES product offerings and desire more timely access to NCES information.

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Principal findings of the project are that, in general, the end-user interface is the weak link in the Government's program for providing statistical information regarding the state and progress of education in the United States. NCES generally serves its pluralistic information-using community well. The Center packages its information in a variety of formats and product types, and delivers them in a variety of ways. The Center "keeps up" with emerging technologies such as CD-ROMs and Automated Fax Response Systems. Its information content is viewed as comprehensive and of good quality. Principle weaknesses are in the areas of timeliness, delivery targeting and user awareness.

Taking into consideration the information gathered in all phases of this study, User Technology Associates recommends the following to expand and enhance the dissemination of NCES information:

- Full Implementation of an Automated Fax Response System
- Expanded Utilization of CD-ROMs
- Connection of OERI Bulletin Board to Internet
- Referencing and Promotion on ERIC
- More Coordinated Utilization of Diskettes
- Enhanced Mailing List Management

Each alternative is presented in Section 9 with supporting analysis and justification in Appendix A. These recommended alternatives help position NCES to better serve the needs of its diverse user community in the future.

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PREFACE

This is the final document of the NCES Data Dissemination Analysis project. The ultimate purpose of the project is to make recommendations as to various types of data dissemination techniques NCES should employ in order to satisfy the needs of the user community.

In order to execute the analysis, the project has been broken into three phases (Sections 1-5). The first phase entailed analyzing the products generated by NCES and how they are currently being disseminated. Additionally, it included a review of what is being done or is planned by other Government agencies that have similar data and information dissemination requirements. Finally, the phase one activities included looking at what is being done or planned in the private sector in the area of data dissemination.

The second phase (Section 6) of the project entailed interviewing experts in the field of data and information dissemination technology. The experts provided additional information regarding emerging technologies and strategies for data dissemination.

The third phase of the project (Sections 7-9) includes interviews with users of NCES data and information. During this phase of the project, user preferences regarding the formats of information and the physical vehicles for receiving the information was solicited. In this final phase, alternate strategies for employing suitable dissemination techniques and products are recommended to NCES.

Each phase of the project builds on the information gathered during the previous phases. Therefore, the document itself grew as the project progressed. The document, as it currently stands, represents the results of the entire Data Dissemination Analysis project.

This document initially speaks about various goals of NCES, and at times it addresses some organizational or procedural issues within OERI and NCES. The use of certain types of technology depends in large part on the data dissemination strategy being employed by the organization. Various management issues have a major impact on how information is eventually moved out to the user community. It is intended that the subject matter of this document stay with the analysis of physical means (technologies) associated with data dissemination. Other issues will only be described or presented as a means for providing a context in which to speak about the technologies.

SECTION 1. THE NCES MISSION

1.1 NCES Background

The National Center for Education Statistics (NCES) serves to assemble, maintain, and disseminate a comprehensive information base to support programmatic planning and decision making at all levels of education in the United States.

In general, education is a community-based activity; program operations, both public and private, are largely managed and controlled at the school district, township, institution, county, and state levels. The Federal Government provides research, planning, financial and administration support. NCES, which is a unit of the Office of Educational Research and Improvement (OERI), of the U.S. Department of Education, provides the statistical base.

In 1988 the Augustus F. Hawkins - Robert T. Stafford Elementary and Secondary School Improvements Amendments defined that the mission of the National Center for Education Statistics

> *"...shall be to acquire and diffuse among the people of the United States useful statistical information on subjects connected with education (in the most general and comprehensive sense of the word) particularly the retention of students, the assessment of their progress, the financing of institutions of education, financial aid to students, the supply of and demand for teachers and other school personnel, libraries, comparisons of the education of the United States and foreign nations and the means of promoting material, social, and intellectual prosperity through education."*

In order to execute its mission, NCES, frequently referred to herein as "the Center", conducts a program of annual, biennial, and ad hoc surveys. The surveys are of students, and their condition and progress; of teachers at all levels; of schools at all levels, both public and private, both for-profit and not-for-profit; of libraries; and of the financing of education in terms of both student aid and institutional funding. Some surveys are conducted solely by the Center; others are conducted jointly with other Federal agencies, such as the Census Bureau.

The data collected by means of these surveys are assembled, processed, validated, combined with data from other surveys and other years, and otherwise organized into useful statistical information. Within this report, <u>data</u> are considered to be the "raw numbers," that is the basic material reported by the

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individual survey respondent, in whatever media, or however assembled, while statistical information designates any combined, consolidated, or otherwise further processed representation, arrangement, organization, or interpretation of such data.

Information dissemination is the process of getting information into the hands of those who need it. In light of the wide variety of users of education information, NCES has traditionally made its statistical information available in a variety of forms (tabulations, graphs, text, etc.) and in a variety of media (magnetic tapes, publications, floppy disks, etc.). Furthermore, while some of its "products" are distributed directly to end users by means of mailing lists, for example, other products are made available through third party entities such as the Government Printing Office (GPO), the National Technical Information Service (NTIS), and the Depository Library System.

There are complex problems associated with disseminating information in support of the highly diverse, geographically dispersed, community-based education activity in the United States. Problems result from the diversity of requirements and preferences regarding both content and delivery mechanisms coupled with the lack of controls, standards, and equipment compatibilities associated with such individual and organizational diversity. Clearly, NCES requires a well structured dissemination strategy; one that addresses and utilizes those delivery mechanisms wanted by its end-user community.

1.2 NCES Information and Data Vehicles

NCES data and information are packaged into what may be termed physical "forms" or "vehicles", such as publications or compact disc read only memory (CD-ROMs). The data and information are made available in a variety of forms in order to satisfy the needs of a diverse range of "consumers", such as researchers, legislators, educators and parents. NCES strives to recognize and satisfy the needs of its audience by maintaining an awareness that each participant in the education process has a different perspective on and interest in the world of education, and therefore, may have differing requirements.

In recognition of its mission, NCES has a number of user-oriented goals, with respect to the data and information that it makes available. The goals for the NCES-generated data and information are shown in figure 1-1.

FIGURE 1-1 NCES Information Goals

- Accurate - Accurate data and information are a requirement of every statistical or scientific organization. If the correctness cannot be ensured, the data are of no use. Lack of user confidence in the accuracy of the data/information will reduce the demand for it.

- Timely - NCES is committed to improving the timeliness of products which are generated. In many cases, the sooner the information is available, the more impact it can have on current decision making, whether it be public budget decisions or commercial product development decisions. While some information is meant to be depicted over periods of time, the more up-to-date the information is, in general, the more pertinent it will be to current "real-time" decision making.

- Accessible - Accessibility addresses both the issue of physical availability and cost. NCES attempts to make statistical information accessible by generating a variety of products and services such as publications which can be maintained in libraries or electronic bulletin boards which can be accessed by computer. Additionally, the concept of accessibility addresses the issue of cost. Excessively prohibitive pricing of NCES products would reduce its availability to target audiences. The NCES commitment to the goal of accessibility is the basis for this document, which seeks to identify cost effective means by which information may be made more readily available.

- Intelligible - This goal addresses NCES information rather than the data. It deals with providing information at a level of detail and consolidation that can be understood. For less statistically sophisticated users of NCES products, it allows them to read the numbers and state, "I know what that means".

- Meaningful - This goal relates directly to the NCES mission in that the data and information are meaningful; that they have significance or value. If NCES has done its job, the information it generates should be "...promoting material, social, and intellectual prosperity..." If the data and information are meaningful they can support critical decision-making at various levels of government and also within the private sector.

- Physically Utilitarian - Utility connotes that something is functional rather than aesthetic. NCES is striving to deliver its information in ways that are functionally and technologically compatible with the capabilities of its user community. The concept of utility is critical with regard to data dissemination due to the continual and rapid evolution of technology and information access systems. Conversely, NCES must ensure that it does not become so enamored with technology that technical solutions are too sophisticated for users to employ, either due to complexity or cost.

1.3 NCES Current Evaluation Program of Information Dissemination

NCES conducts a continual evaluation of its dissemination strategy. Part of that strategy includes utilization of various technologies in addition to the implementation of certain procedural and organizational schemes. The end result of this study is a recommended program of dissemination media and mechanisms for the future and a description of the resources required to support such a program. The recommendations for comparing various output procedures and products takes into consideration means to balance the three requirements of "better, faster, cheaper."

SECTION 2. THE PRELIMINARY ASSESSMENT OF THE NCES USER COMMUNITY

2.1 Preliminary Categorizations of NCES Users

For the purpose of this study, the "NCES user" community has been defined as the customer base for all available education data or information. The "NCES user" community has been classified into different clusters in order to clarify the different groups that access and utilize that data and information.

The distinct patterns of data or information use have been analyzed, and used as the means to define the "NCES user" population and their different needs and wants. For example, users in the roles of planning, funding, and administration of education activities are differentiated by types of information used, and technical preference of dissemination mechanisms among other distinctions. Thus, the qualification stated in the NCES mission to serve "the people of the United States" is given a more meaningful representation.

The "NCES user" community is a highly diversified audience. Who the users of education data or information are is defined by the many different user requirements of the diverse range of users. The "user" population consists of people with different roles in society each having different objectives to fulfill. Depending on the type of "consumer", there are different requests to satisfy a specified need or want. For example, users can be researchers interested in numbers for the purpose of analysis, or parents with general informational questions about the quality of secondary education in their home state.

The "user" community is further defined by skill level in terms of how educated a user is regarding statistical manipulation of data and information. This definition differentiates the user in relation to what type of format is required and through which mechanism they want the data or information presented. This format requirement is also connected to the user's interests and informational needs. For example, a user who is interested and skilled in data manipulation may find that raw data and tabulated data are the format types that meet his/her needs most often.

In addition to the format requirement, there is an issue of what product form or mechanism the user most prefers. Product form addresses how the data or information are made available, such as via publication, electronic bulletin board or CD-ROM. Many of the newer product forms are "technology" oriented.

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Therefore, the user community can be further defined by the level of experience it has in using the available technologies. Based on his skill level, the user may have a particular product preference. For example, the needs of a user who is highly skilled in technological capabilities, would be best served through CD-ROM or a 9-track tape products. Less technically sophisticated users will generally prefer information packaged in printed publications.

Based on the factors discussed above, the array of users can, in general, be classified according to:

- User composition (Who)
- Type of information wanted (Format)
- User interface capability/preference (Dissemination Mechanisms)

2.2 Preliminary Analysis of NCES User Community

A preliminary analysis of the user community has revealed broad categories classifying users according to their different interests and purpose in acquiring education data and information. The following five groups define each user segment by classifying the population "need" attributes. "Need" attributes are defined by the data or informational requirements of the user. Further in-depth analysis focused on understanding the needs of the user community will be conducted during a later phase of this study. The first level of NCES users are grouped by the category of the user. These categories are Researchers/Analysts, Policy Makers, Commercial Community, Educators, and Concerned/Interested General Public.

- Researchers/Analysts - These users work with numbers and manipulate the data. They are often interested in "microdata" or raw data. They conduct their own analyses and generate interpretations of the data. "Microdata" are data in its most primary form, usually presented as the lowest and most detailed record of data. Users of raw data are highly skilled in the various technologies and data manipulation methods. They perform in-depth statistical work on the data and create new information.

- Policy Makers - This segment includes the Federal and State decision makers and legislative people. This group includes politicians, Government agency executives, and regional and state governments and boards. These users seek information regarding educational issues to support policy and funding decisions, and are often political in nature. They are more interested in bottom-line statistics or numbers to use for reports, speeches, raising awareness and to support specific goals.

- Commercial Community - These users include all those whose business activity is related to the education arena. This includes large and small businesses and industries. This user segment follows educational information closely to strategically plan their operational activities. Generally, their needs are for summary information which includes trend and forecasting analyses.

- Educators - This group of users is involved in the field of education. They would include teachers/professors, administrators, universities, libraries, educational associations and state and local educational agencies. These users would be interested in more summary, trend projection and bottom-line information. The information would be utilized for scheduling, staffing, budgeting and educational opportunities. The information would also be for quality measurement studies. These users may also be involved in continuing the dissemination process to the interested user. For example, libraries are interested in having and making available all forms of educational information to serve the general public for their basic research needs.

- Concerned/Interested General Public - This segment includes concerned parents, students and community leaders. The information requests would be for specific "quality" issues. These users are searching for information regarding the quality of education in a certain area to make decisions for the future. For example, the user may inquire as to the quality of education and the characteristics of educational offerings within a certain school district. Also, there may be inquiries in reference to opportunities within the education field. An example of this is someone newly relocated to the area who may be looking for job opportunities in the educational field, either in a staff or administrative position and is searching for employment information.

While there may be good arguments to either compress or expand the number of user groups that have been defined, the major point to be garnered is that there is a wide variety of users with an even larger number of information requirements. This being the case, it is anticipated that the approach to satisfying the information needs of the varied user population will be the continued development of multiple highly focused delivery mechanisms.

2.3 Information/Data Formats

Due to the fact that there are a wide variety of user types who have varying levels of information needs coupled with a range of technical capabilities, the issue of data/information format arises. Since the variance in the user population is substantial, so are the requirements for diverse format types. In order to address this issue, the various products generated by NCES were analyzed and then grouped so that they could then be related to the previously defined user groups.

For purposes of this study, the different formats of data/information presentation have been grouped into four basic types. These formats are classified as shown in Figure 2-1.

FIGURE 2-1 INFORMATION AND DATA FORMATS

NCES INFORMATION FORMATS			
RAW DATA	TABULATED DATA	VISUAL/GRAPHICS	TEXTUAL INFORMATION
Data that has been collected directly from a survey instrument. It is in data element form only. The data has not been manipulated or tabulated.	In essence, this is raw data that has had some kind of statistical work or analysis run on it. It may also be summary data that has been organized into rows and columns such as two dimensional tables or spreadsheets. This includes variable analysis, consolidated data, and analyses regarding trends, series, or forecasting. An example of this type of information is what would appear in an E.D. Tabs document, published by NCES.	This is information that has been analyzed and prepared in a visual or graphic manner. This type of information is "presentation" oriented. Information is presented in table, graph or chart format. This includes bar graphs, line graphs, and pie charts. Charts and graphs often appear in NCES publications or survey reports or other documents such as *Youth Indicators 1991 - Trends in the Well-Being of American Youth.*	This is information that is presented mostly in a narrative or verbal format, with some numbers or tables to support the text. Publications such as technical reports, research reports and analysis reports tend to be of this type, relying more heavily on the written format, as opposed to numeric data.

Some natural trends appear when evaluating the categories of users with the desired type of data or information. Typically, the more analytical users, who are in the business of converting data into information, require raw or tabulated data. As the user population moves closer to the general public, the requirement gravitates toward more textual and visual formats. In this area, users are looking for more simplistic, consolidated and easy to interpret information rather than data.

2.4 Dissemination Mechanisms

The third variable that must be taken into consideration in analyzing the user population is the desired choice of dissemination mechanisms or as identified earlier the "user interface capability/preference". Overall, it appears that the more technically sophisticated the user is, in terms of equipment availability and complexity of tasks, the greater the tendency to choose more advanced technology products as a vehicle for acquiring information. For instance, a researcher or analyst with access to various equipment would be more apt to utilize raw data from a CD-ROM whereas, a member of the general public may be more likely to use a telephone request line. Different methods of information dissemination are listed and discussed in detail in the following sections. Likewise, ongoing analyses of the NCES major user population revealed more insightful categorizations.

This section has presented a generalized picture of the NCES information user population. While the framework outlined above may seem to be a rather simplistic or debatable division of the formats and utilization of education statistics and information, it is critical to group the community for planning which technologies to employ to satisfy various user populations.

SECTION 3. THE DISSEMINATION FUNCTION

Information dissemination is the process of moving information from its final assembly point out and into the hands of the end users of that information.

Information dissemination corresponds, in commercial terms, to the physical distribution function, which is the process of moving product from the finished goods inventory of the manufacturer, through a variety of channels, into the hands of the final consumer.

This section provides a brief description of some of the components of the dissemination process, as well as definition and clarification of some of the key terms and issues involved in the assessment and planning of major continuing programs of information dissemination.

3.1 Products and Services

Information is made available in a variety of forms, e.g. magnetic tapes, floppy disks, CD-ROMs, statistical publications, research reports, newspaper articles, and television announcements, to name a few. When these dissemination mechanisms, or vehicles, contain information, they are referred to as information products. A product is defined by its information content and its vehicle type: 1991 enrollment data on tape and 1992 enrollment data on tape are two different products. Similarly, 1991 school enrollment data on tape and the same data on disk are also two different products. In contrast, two disks of the same type containing identical information are considered multiple copies of the same product.

An information service is provided when information is processed, or its form or location is changed. In this sense, information services are provided in each of the following cases:

- The contents of six tapes are combined on a CD-ROM.
- Contents of a CD-ROM are accessed and displayed.
- A Fax is sent from Washington to Minneapolis.

In general, products are information packages in static form, while information services are the actions that put in motion the dissemination process. A computer bulletin board, for example, represents services (information acquisition and set-up), a product (the information in board form), and more services (facilitation of the user access and data transmission process).

Distribution of information by an information source to the end user, and access by the end user back to the source, are the two components of dissemination. Distribution connotes a "pushing" of information from the source; access connotes a "pulling" of information from the destination. From the "manufacturers'" perspective, distribution is a proactive process, while providing access is a passive dissemination process. From the users' perspective, the reverse is true: distribution is the passive form, and access is active. The following discussion shall be from the perspective of the source of information.

3.2 Proactive Dissemination

This concept addresses the issue of actively "distributing" products that are generated, without there being a formal request for the particular product. This situation is most common with respect to publications. It is based upon historical knowledge of who has previously requested or utilized the data, and educated estimates of those who may have a need for the information. For example, a study might be automatically sent to chairmen of certain Federal or State education committees immediately after the initial printing of a document. This decision is usually made in the development of the source's dissemination strategy. As part of the dissemination strategy, any production problems, size of the print run, and the target audience for the document must be determined. A decision must be made as to who should receive a copy of the document at the initial printing and who should receive an announcement that the document is available. By employing this dissemination strategy, probable users of the source's data and information receive it as soon as it is available.

3.3 Passive Dissemination

This concept addresses the idea of making the information available, or "putting it out there", and then letting anyone take the information who might have an interest in it. Electronic bulletin boards are an example of passive dissemination. Those who are interested in utilizing the bulletin board need only call in to the system to obtain the information. This means of dissemination makes information immediately available as spontaneous needs arise.

Meeting the demands of written or verbal requests for documents or specific statistical information may also be met by other passive dissemination techniques. Two other passive dissemination activities include responding to mail-in requests for documents, or the offering of some form of toll-free telephone "800" number assistance. Both of these dissemination activities can be performed through an in-house "service center". In this case, a staff of employees is dedicated to operating phones and mailing out documents.

3.4 Product Visibility

The proactive versus passive strategies are both ways of getting information to the user. There is another component to the dissemination issue which needs to be addressed, and that is product visibility. Product visibility embraces the concept of "marketing" the products that the organization has to offer. There are a variety of ways in which products may be promoted. Some of these activities include:

- Distributing Product Announcements - Announcements are a one page description of what is in a newly completed survey, study, or analysis report and where the associated document may be obtained. Announcements are sent to a designated target audience.

- Advertising in Newsletters - Newsletters can provide a variety of information and statistics. Newsletters include descriptions of new products which are in development or have recently become available.

- Distributing Clip Sheets - Clip sheets are generally 2-3 page documents which provide information for various associations to put in their newsletters. The information is provided as short paragraphs of ideas, facts and statistical data which may be directly incorporated into newsletters.

- Attending Exhibits and Conventions - A "manufacturer" or information producer may go to conferences and other such gatherings of potential product users, to promote their information products.

- Utilizing Promotion Capabilities of Secondary Distributors - Often, there is more than one distribution center for a source's information. Other organizations, such as public information centers, may be involved in the distribution process.

The two components to dissemination discussed in this section (proactive/passive), while not "technical" in nature, are critical for a data and information provider to consider as part of the development of an overall dissemination strategy. An organization bent towards passive dissemination might direct the strategy to heavy utilization of electronic bulletin boards or phone inquiry systems. A drive towards proactive dissemination of information might lead to heavy reliance on automatic fax transmission of new statistics and information. In either event, the issue of product visibility and creating consumer awareness of the availability of the information will be critical to create the "pull" for the products.

SECTION 4. CURRENT NCES DISSEMINATION METHODS

NCES information products are grouped into four formats that are then distributed by one or more of the nine physical vehicles currently used by NCES.

4.1 Product Generation and Types

NCES provides four basic formats of information/products. They may be classified as raw data, tabulated data, visual/graphic data (pictorial), and textual data (written analyses as opposed to numerical data). These various formats of data are, in general, produced as a result of the execution of a survey.

The format and media of a particular type of NCES product is determined in the early stages of the project execution. The actual dissemination of the document is based on an approved dissemination strategy. The two components to dissemination discussed in section 3 (proactive/passive) are critical for NCES to consider in terms of the development of an overall dissemination strategy.

The dissemination strategy of NCES is agreed upon by a group of Office of Education Research and Improvements (OERI) staff who participate in a dissemination strategy meeting. The meeting is comprised of various staff associated with the project including the survey author, editor, a publications representative, a representative from the Education Information Branch (EIB), representatives of the Outreach Branch and the Acting Commissioner of NCES.

When a survey has been performed, the raw data generally comes to NCES from the contractor on a 9-track tape. Depending on the contract, the data may also be received on micro-diskette, 3480 tape cartridge and, in some cases, on a compact disc-read only memory (CD-ROM) or magnetic optical disk (both read and write capability). The information is then made available on the Boeing Computer Services (BCS) computer system or the National Institutes of Health (NIH) computer system. The information may also be dumped to diskettes utilizing tape drives located at NCES offices. At this point in time, the information is available for verification, analysis, and tabulation.

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Upon completion of the initial capture of the raw data, the information can be disseminated in a variety of logical and physical ways. As stated earlier, the logical formats for disseminating the information include raw data, tabulated data, visual/graphic data and textual data. These four logical formats are presently being disseminated in a wide variety of physical ways.

Current physical vehicles of dissemination include:

- ***PUBLICATIONS***
- ***9-TRACK TAPES***
- ***3480 TAPE CARTRIDGES***
- ***MICROCOMPUTER DISKETTES***
- ***INFORMATION NETWORKS***
- ***ELECTRONIC BULLETIN BOARDS***
- ***ON-LINE SERVICE BUREAUS***
- ***CD-ROMS***
- ***E-MAIL***
- ***FAX***
- ***TELEPHONES***

The following subsections describe each vehicle that is currently used as a physical means of disseminating NCES information.

4.1.1 Publications

OERI develops and disseminates a wide variety of publications. The content of these publications ranges from survey documents which provide little more than tabular data, to sophisticated studies which provide more complex analysis of raw data. The analysis documents tend to contain more textual information with occasional tabular data or graphic presentations. Publications may be large, bound documents which run into hundreds of pages such as the *Digest of Education Statistics* or small handout leaflets or pocket advisors such as *Projections of Education Statistics to 2001*.

The main mode of publication dissemination is governed outside the realm of NCES through the Education Information Branch (EIB) of the Program Information Division (PID). This division receives approximately 2800 written requests for publications a month. The EIB is responsible for the stocking and dissemination of the publications. A private contractor is used to perform bulk distribution of selected documents. The Government provides the documents and the mailing labels to the contractor and then the contractor distributes the documents. Documents are also distributed through the Government Printing Office (GPO) and the Consumer Information Center.

4.1.2 9-Track Tapes

The Education Information Resources Division, Data Systems Branch (DSB) is responsible for the sale of tapes which contain public information. Every survey conducted by NCES which has data for public dissemination is kept on file in both EBCDIC and SAS format. All of the data available for tape sale are generated as a result of NCES studies. Information is retained at Boeing Computer Services in Vienna, Virginia.

Requests for public use tapes are made either through phone calls to the Data Systems Branch or through mailed order forms. OERI produces and distributes an OERI Directory of Computer Data Files which describes the tapes that are available, and the price of the product. An order form is also included. Approximately 900 tapes are available for purchase. Customers can obtain files on either 1600 or 6250 BPI 9-track tapes. The information can be provided on EBCDIC, ASCII or SAS code conventions. Once an order has been placed, a computer job is executed from OERI causing the requested tape to be generated at the Boeing Data Center. Boeing sends the tape to DSB which in turn mails out the tape. The cost for tapes generally runs in the range of $175 for a single tape, with reduced rates for multiple tape files.

Because the DSB has access to the NCES tape files, it has become involved in disseminating the information on those files using other media. In addition to providing tapes, the DSB produces mailing labels and hard copy mailing lists of groups such as schools, libraries and school districts. These are done on a special request basis at a negotiated cost to the customer. Some of this type of information is also sold on microcomputer diskettes. Raw data from surveys are not usually put on diskettes. In general, researchers tend to ask for raw survey data, and they want it on tapes. The commercial community usually requests mailing lists and labels, and want them on hard copy or diskette.

The DSB receives approximately 500 orders for data per year. The orders cover tapes, diskettes and hardcopy information. In some cases the orders request multiple products.

The user population tends to fluctuate with various types of customers desiring only one or two data products. Additionally, the customer base tends to change, as opposed to the same customers requesting information every 4, 6 or twelve months. DSB staff estimate that between 75% and 90% of the customers request specific information not complete data sets.

While DSB is responsible for disseminating publicly available tape information, NCES controls distribution of tapes which contain restricted information. NCES first requires the customer to sign a non-disclosure license agreement to ensure protection of the information. Secondly, a user must be able to justify to NCES their planned use and give reasons as to why the public file is not sufficient for their needs. Penalties are applied to users who do not conform and comply to these agreements. If a tape which contains restricted data has been requested, NCES/SSMD will generate the tape and distribute it to the customer, rather than DSB. These procedures are necessary to protect potential confidential information. In order to maximize the utility of the statistical data NCES provides, it is suggested that NCES develop a Procedures Manual that addresses all aspects relating to access to identifiable information.

Even though DSB is responsible for tape sales, there are other groups such as the Postsecondary Education Statistics Division which, on occasion, produce and distribute tapes. These tapes may be generated for other Government Agencies or for special request groups. Generally, they are produced at no cost to the requesting organization. The tape duplication is executed by dumping the data from a 9-track tape (NCES has tape drive) to a PC hard disk and then re-dumping to a blank tape.

4.1.3 3480 Tape Cartridges

Customers may obtain NCES data on 3480 tape cartridges. Any data available on 9-track tape can be obtained on a tape cartridge. The ordering process for cartridges is the same as for tapes. Cartridges are also generated by the DSB.

4.1.4 Microcomputer Diskettes

The DSB provides information on diskettes only at special request. Raw data are seldom put on diskettes, in part, due to the size of raw data files. Information which DSB puts on diskette tends to be for commercial customers and the files are generally mailing lists. Occasionally, some groups within NCES would dump raw data files to diskettes at the request of certain users, but this practice is diminishing with the increased utilization of CD-ROM.

4.1.5 Information Networks

Currently, OERI maintains two information systems through GTENet telecommunications networks. Each of these systems, while operated by the same vendor, are maintained independently. One system in plan by OERI is called the Institutional Communication Network (INet). The goal of this network is to facilitate communication and information sharing within the major research, development, and dissemination institutions which OERI funds, such as National Educational R&D Center, Regional Laboratories, and ERIC. Once INet, the base network is established, work will begin on expansion toward increasing public access of the network via connections with existing networks, for broad dissemination of education research and improvement information.

INet will incorporate online databases and bulletin boards which generate information on current projects, new products and services, research funding, upcoming events, and current statistics and indicators. There are also plans for INet to include electronic mail, file transfer, and gateways to other networks.

The other information network is maintained through the National Data Resource Center (NDRC) of the Elementary/Secondary Education Division. Information can be accessed by account holders in three ways: (1) databases; (2) bulletin boards; and (3) electronic mail.

Future plans of NDRC include the development of a dedicated network for certain user groups, such as the National Forum on Education Statistics. Rather than offering a bulletin board service, a forum style will be incorporated where account holders can both read new information and post responses and comments to the board.

4.1.6 Electronic Bulletin Boards

OERI is currently posting NCES related information on four different bulletin board systems, only one of which is operated by the NDRC within OERI. In general, all four bulletin boards provide the same information which includes publications, abstracts of funded research, bulletins, statistical tables, and announcements about awards, projects, requests for proposals, and available data tapes.

The OERI bulletin board system is a toll free system which runs on a specialized multiuser PC which can store up to 320 megabytes of data. There are 5 phone lines into the bulletin board in addition to a connection to the Department's Local Area Network (LAN). Four of the phone lines are toll free and

the fifth line is reserved for a pilot "sub board" used by the National Diffusion Network. Access to the bulletin board through the LAN allows the capability for a large number of users, but the bulk of the users attempt to use the toll free number which is often busy. The system receives about 6700 calls per month.

Most of the information on the bulletin board is tabulated data rather than raw data, because raw data are voluminous and there is not a large demand for it. Staff that run the board felt that there was a very limited requirement for raw data to be provided through on-line systems. Some data are provided on bulletin board, but it is in compressed format which can be downloaded. In some cases, information may be uploaded from users on to OERIs bulletin board upon approval by the Government. Recent additions of full text publications available on the OERI bulletin board include such documents as *The 1990 Digest of Education Statistics*, *America 2000* and *The 1990 Condition of Education*. Much of the same data from the OERI bulletin board are posted to bulletin boards on three national telecommunications networks. They are:

- ED-line - sponsored by the National School Public Relations Associations (NSPRA) on GTENet. This system is used by such groups as state departments of education, school board associations, local education agencies, and professional organizations such as the Council of Chief State School Officers (CCSSO);
- ALANET - the American Library Associations' information network on Dialcom; and
- The Education Research Forum - sponsored by the American Educational Research Association (AERA) on Compuserve.

One problem identified by those responsible for the OERI bulletin board is that information needs to be generated and retained in a standard, useable format which is useful for all modes of dissemination when an original publication is generated. For example, the bulletin board staff must take information from the "Production Document" format (e.g., a standard word processing or desktop publishing package), which is the original format of the data, and then convert the data to an acceptable format to be used by the bulletin board. The information would be easier to use on the bulletin board if it were originally generated in a useable format such as ASCII. The main objective would be to identify a data format which takes into consideration all modes of data dissemination, thus increasing availability through multiple modes and also reducing the time required to make the data available to the "consumer".

4.1.7 Compact Discs, Read Only Memory (CD-ROMS)

To date, NCES has generated four CD-ROMs. They are the *National Postsecondary Student Aid Study (NPSAS) for 1986-87, High School and Beyond: 1980-1986*, the *National Assessment of Educational Progress (NAEP) 1990, and the School Staffing Survey, 1987-1988*. The data is provided in SAS.PC and SPSS.PC format. NCES does not produce the CD-ROMs, but rather contracts out the work. The Government Printing Office (GPO) has produced the *High School and Beyond* CD-ROM through the 3M Corporation, and NTIS through a subcontract to NIMBUS has produced the NPSAS study. The GPO provides the best price and the shortest turnaround time, but they can only reproduce the data for NCES rather than restructure and manipulate it. NTIS makes CD-ROMs at a higher cost and the turnaround time is slower, but it has the ability to manipulate the data if required.

NCES is in initial phases of CD-ROM production in that it is still evaluating what type of information to provide, the best software means for retrieval, what types of documentation to provide, types and content of packaging information, and best format for the data. It is planned that more and more NCES data will be made available on CD-ROM in order to improve availability and utility of the data.

NCES information is available on CD-ROM in raw data format. This way of presenting the data is useful to researchers and analysts who require entire files of information to perform their studies. The researchers will import the files into their own software systems/package and manipulate the data as required.

4.1.8 On-Line Service Bureaus

NCES maintains data files on two mainframe systems. The bulk of the data is maintained by Boeing Computer Services. Additional data are maintained on a system at the National Institutes of Health. While the data are maintained for use by NCES analysts, other researchers may access the data on the Boeing System in Vienna, Virginia. Those who wish to use the NCES data must first receive approval through NCES. Then Boeing will set up a user ID for the client. The user must sign a contract with Boeing in order to be charged for the connect time while utilizing NCES data. All data available for tape sale can be accessed on the Boeing System. Boeing maintains sanitized versions of NCES data files in order to satisfy privacy requirements. Users may, at special request to and approval by NCES, gain access to confidential data in situations where that data are needed.

4.1.9 Electronic Mail

NCES does not run an in-house electronic mail system, though analysis is currently under way to select one for implementation. Some staff do have access to electronic mail systems through contractors who are presently doing survey work for NCES. In those situations, data may be transferred on an occasional basis, but the main purpose for the electronic mail is to transmit memos, and messages. It is not currently an NCES strategy to disseminate their data via electronic mail.

4.1.10 Educational Resources Information Center (ERIC)

NCES is currently channeling its information to the Educational Resources Information Center (ERIC). ERIC provides NCES information to major users in two ways. First, NCES publications are referenced in the bibliographic database, giving users knowledge of the existence and location of NCES documents. Secondly, some raw data files are accessible through a program entitled ERIC.STAT.

4.1.11 Fax

NCES is not currently utilizing fax capability as part of its dissemination strategy. Statistical information may be sent out through the fax, but it would be on an infrequent and ad hoc schedule.

4.1.12 Telephones

Telephones are critical means of disseminating NCES information. Telephonic dissemination of information takes one of two paths at OERI; either "structured" or "unstructured." The structured path would be through the toll free telephone service center which is run by the Education Information Branch. This mode of passive dissemination only requires the "customer" to call in on either a direct line or an 800 number and request either specific information or a particular document. Frequently, the EIB will receive a phone request for a particular statistic or group of information which is not currently or readily available. For cases such as this, the EIB employs a staff of research analysts who will do special request research and analysis to satisfy such requests. Approximately 1400 of these telephone calls per month are processed with about an even split of the requests routed to each division.

In addition to the "structured" mode of telephonic dissemination is the "unstructured" mode. It is clear that a large part of the OERI staff have some hand in disseminating information to "regular" clients who

are familiar with the various staffs' particular area of expertise. There is, in effect, a loose network of people who know the "right person" to call to get a question answered. Therefore, these information users do not go through the telephone service center. They have their own "black book" of phone numbers. This is very common within OERI and may be considered the ultimate in terms of personalized service.

4.2 NCES Product Marketing

While most products contain a name and telephone number where additional information can be obtained, NCES has a variety of other means for promoting their products. These promotional activities are the responsibility of other organizational groups within OERI, such as Programs for the Improvement of Practice (PIP) and the Education Information Resources Division. While various members of NCES may distribute data or information on an informal, ad hoc basis, the actual responsibility for dissemination of NCES information lies outside its jurisdiction. Therefore, the dissemination strategy for NCES data and information is somewhat unfocused. This situation may result in less than optimal implementation of currently existing and future data dissemination technologies. Currently, five dissemination methodologies are used to proactively and passively market NCES products and data files. These activities include:

4.2.1 Development and Distribution of Product Announcements - Announcements are sent to people on target lists. These lists identify the names and addresses of probable users of the product that is being released. The dissemination strategy meetings are used to determine which lists should be used for the announcements.

4.2.2 Advertising New Publications in the Quarterly Newsletter - OERI publishes a quarterly newsletter which is distributed to users of OERI information. The newsletter provides a variety of information and education statistics. Additionally, it includes a description of new products which have become available since the previous newsletter.

4.2.3 Distributing Clip Sheets - NCES information is provided as short paragraphs of ideas, facts and statistical data which may be directly incorporated into newsletters.

4.2.4 Attendance at Exhibits - Through the Exhibit Program, Outreach staff go to conferences and other such gatherings of potential product users, to promote the information generated by OERI. Generally,

publications rather than disks or tapes are promoted. While the staff may attempt to sell some documents, for the most part they either distribute documents or promote data that are available for public use.

4.2.5 Utilizing Promotion Capabilities of Secondary Distributors - OERI is not the only distribution center of NCES products. The Government Printing Office and its outlets also sell OERI products as does the Consumer Information Center, in Pueblo, Colorado. OERI accrues the benefits of any advertising employed by these organizations.

The Outreach staff of the PIP is geared more towards the dissemination and marketing of publications, rather than promoting the full array of products and access methods available within OERI. Other NCES product marketing responsibilities are assigned to the individual(s) throughout OERI based on their area of functional expertise. The success of both proactive and especially passive means of data dissemination are very closely tied to the activities of the Outreach staff, and the Education Information Resources Division.

SECTION 5. CURRENT INFORMATION DISSEMINATION PRACTICES

Information dissemination is evolving as data processing and communication technologies improve. A sample of the current information delivery mechanisms of select Government agencies and commercial contractors in the private sector was taken.

This section provides a description of the information collected as a result of interviews with selected Government agencies and commercial contractors in the private sector. The purpose of these interviews was to determine:

1) What techniques other Government agencies are employing or planning with respect to information and data dissemination; and

2) What techniques commercial contractors in the private sector are employing or planning in the area of data and information dissemination.

The main thrust of the analysis is to identify any dissemination technologies or processes which are currently being utilized or planned by others which NCES could employ in serving its end-user community.

Eight Government agencies were selected for site visits based on the assumption that they have dissemination needs and characteristics similar to NCES. The agencies that were selected are involved with the management of large data banks and are responsible for delivery mechanisms which serve an assortment of different "users".

Seven commercial contractors were selected based on the dissemination service that they provide to the Government. Pure technology (e.g., hardware, software) companies were not selected for interview unless cutting edge technology was being employed. For example, a company that manufactures or sells standard hardware would not be selected for interview, whereas a company that is incorporating new technologies into their products may meet the selection criteria. Likewise, a company, such as Boeing

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Computer Services, which integrates the hardware and software and then provides an on-line information dissemination capability qualified as a service provider.

A combination of data collection techniques was used to gather information about individual agencies and contractors. These techniques included single face-to-face interviews, telephone interviews, and group meetings. In an effort to gain a clear understanding of the methods applied in each organization, multiple interviews within an organization were held in several instances.

The information collected from each organization pertained to the type of information being generated, the types of services being provided and the different vehicles utilized for dissemination purposes. In general, the purpose was to create a picture of what information was being produced, and how it was "leaving the building".

Prior to the execution of the data collection, certain topics were selected as subject areas for an interview guide. Interviews were conducted in order to identify:

- The type of information being produced;
- The organization's dissemination policies in reference to statistical data;
- The "users" of the organization's data;
- The different formats in which the data are presented;
- The type of information products being distributed.

Not only were dissemination methods that are presently being utilized discussed, but also the dissemination methods that are currently in the planning phase, and any future technologies that may enhance dissemination efforts.

The major elements of the dissemination function were identified. This included the components, alternate channels, alternate vehicles, and the effectiveness of these methods. Attributes of cost, timeliness and quality were discussed. It was noted when there was any kind of inconsistency between what NCES is doing and what the agency being interviewed is doing. Attention was focused on any "new" or "different" dissemination systems or new applications in place, or in the planning phase.

5.1 Interviews With Government Agencies

The selected Government agencies are introduced below. For each individual agency there is a brief synopsis of the agency's functions and information environment. These sections include a summary of what kinds of information each agency processes and their role in the dissemination of information.

5.1.1 Introduction to Government Agencies and Their Information Environment

Representatives from the following Government agencies were interviewed:

- Bureau of the Census (BC)
- National Science Foundation (NSF)
- Federal Aviation Administration (FAA)
- Bureau of Labor Statistics (BLS)
- Bureau of Economic Analysis (BEA)
- Social Security Administration (SSA)
- National Center For Health Statistics (NCHS)
- National Cancer Institute (NCI)

- Bureau of the Census (BC) - The BC provides a wide range of products to a wide variety of users. BC is a "general purpose" statistical data agency. The Bureau's demographic and economic statistics reflect most aspects of America's society and economy. The Data User Services Division is responsible for facilitating the use and dissemination of the Bureau's findings among the nation's people, institutions, and business.

- National Science Foundation (NSF) - NSF's primary function is to act as a "middleman" in the repackaging of data that originates from other Government agencies. NSF also conducts longitudinal surveys of individuals in a variety of technical and scientific disciplines. This information is heavily restricted and confidential. Their clientele is very limited, consisting of the OMB, Congress, other Government agencies and the NSF members. They are in the business of advising Congress and Executive Branches of the Federal government, not "diffusing" information to the general public.

- Federal Aviation Administration (FAA) - The Statistical Analysis Branch of the Management Standards and Statistical Division of the FAA gathers statistics regarding aircraft, airmen, aviation operations, aircraft accidents, etc. The information that is generated is used primarily for internal purposes, which includes measuring aviation workload, and planning improvements in the support of national aviation systems. Most of the external users of their information are aviation planners.

- Bureau of Labor Statistics (BLS) - BLS is responsible for the generation, interpretation and dissemination of statistics regarding the nation's labor force. BLS generates a variety of indicators which relate to the American work force. Some of these indicators include information about National and State employment/unemployment levels, earnings information, pricing information (such as the Producer Price Index, and the Consumer Price Index), import/export data, and productivity statistics. The information produced by BLS is used by industry, Government and the general public. The variety of BLS users include economists, social scientists, researchers, managers and policy makers. BLS offers many different dissemination mechanisms for users to access their information. BLS most resembles NCES in terms of statistical products generated and diversification of its user community.

- Bureau of Economic Analysis (BEA) - The mission of BEA is to manage a large data bank and disseminate the information contained therein. The Bureau has been running programs for

approximately two years. There are two main on-line dissemination programs that currently exist; the Economic Bulletin Board and the National Trade Data Bank. All of the data available from BEA are a collection of data from approximately fifteen other agencies. Some of these agencies include the Federal Trade Commission, the Bureau of Labor Statistics, and the Census Bureau. BEA is involved in no statistical data origination, just delivery of data and information collected by others.

- Social Security Administration (SSA) - SSA is responsible for generating and disseminating information on the Old-Age, Survivors, Disability Insurance (OASDI), and Supplemental Security Income (SSI) programs and on the populations that these programs serve. All statistical data and survey results are available to the public mainly in publication formats. These include a number of statistical releases, monthly journals, research reports and technical papers. Their primary mission is providing programmatic support for SSA policy and operations.

- National Center For Health Statistics (NCHS) - NCHS is the principal agency in the Federal Government for statistics on the health related well-being of the nation's people. The mission of NCHS includes data collection and analysis, data dissemination, research in statistical and survey methodology, technical assistance in the United States and foreign countries, and cooperative programs with State, national and international organizations. NCHS data systems cover a full range of concerns in the health care arena, including overall health conditions, lifestyles, exposure to unhealthy influences, various illnesses and disabilities, and the condition of health care. Their dissemination strategy is designed to provide useful information to a variety of users, which includes policy makers, medical researchers, and to others in the health community.

- National Cancer Institute (NCI) - NCI serves as the national center for the distribution of information and data on cancer research. The Institute plans, directs and coordinates an integrated program of cancer treatment research as well as research conducted in cooperation with other Federal agencies. The information and data are disseminated among the concerned general public, which includes researchers, physicians and patients.

5.1.2 Current Technologies Utilized by Agencies

Thirteen vehicles or dissemination mechanisms are currently used by other government agencies as means of distributing data and information products to their constituencies [user communities].

After interviewing the different Government agencies, Figure 5-1 was generated. This exhibit identifies various dissemination methods currently available or in planning phase by the eight Government agencies contacted. Each individual dissemination method is discussed below in regard to the extent to which they are employed by the government agencies.

- Publications - The majority of those agencies interviewed provided their statistical information in hard-copy form. Publications are generally the most widely accepted and used vehicle to disseminate information. The general attitude was that publications have always been around and that they are the most preferred and easily accessed form of dissemination for the occasional or general user of

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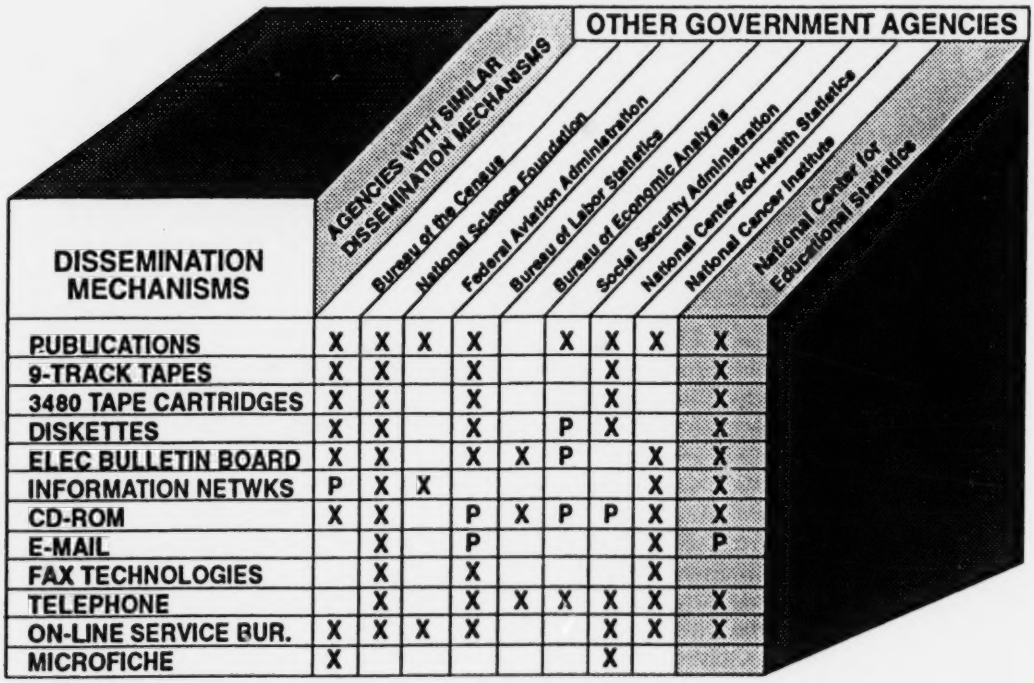
FIGURE 5-1 DISSEMINATION METHODS OF OTHER AGENCIES


OTHER GOVERNMENT AGENCIES
DISSEMINATION MECHANISMS
AGENCIES WITH SIMILAR DISSEMINATION MECHANISMS
Bureau of the Census
National Science Foundation
Federal Aviation Administration
Bureau of Labor Statistics
Bureau of Economic Analysis
Social Security Administration
National Center for Health Statistics
National Cancer Institute
National Center for Educational Statistics
PUBLICATIONS X X X X X X X X
9-TRACK TAPES X X X X X
3480 TAPE CARTRIDGES X X X X X
DISKETTES X X X P X X
ELEC BULLETIN BOARD X X X X P X X
INFORMATION NETWKS P X X X X
CD-ROM X X P X P P X X
E-MAIL X P X P
FAX TECHNOLOGIES X X X
TELEPHONE X X X X X X X
ON-LINE SERVICE BUR. X X X X X X X
MICROFICHE X X
X = In use P = Planned
NCES/TPF-004d

NCES is currently using the same selection of dissemination mechanisms as the other agencies contacted.

information. However, several of the agencies are trying to minimize the use of generating "immense" volumes of statistical data for storage purposes. Publications are most widely used for studies, reports, digests and summary information.

- Magnetic Tapes - Magnetic tapes, in the forms of 9-track tapes or 3480 tapes, are used mainly for storage and transportation of data and information. For example, NCI utilizes tapes as a vehicle to transmit data for input on CD-ROMs. Tapes were widely available for heavy users of the statistical information upon request to the agency. The information contained on these tapes is usually customized for the users. The statistical data and information is usually "cleaned" of any confidential or identifiable information.

- Microcomputer Diskettes - Microcomputer diskettes are in use at several agencies. Many of the agencies are trying to move away from diskette use due to storage, cost and time factors. Diskettes were often copied for user requests, however this became an expensive task in terms of overhead costs. Also, the diskettes do not have the capacity to store some of the enormous raw data sets. While some agencies are phasing out this technology, others such as SSA are looking forward to having all of their major statistical data placed on diskette.

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- On-line Service Bureaus - In general, most agencies offer on-line database access to their information, either by providing the service internally or through the services of an external commercial contractor. Internally, some agencies provide access to information through databases or bulletin boards. For example, BEA provides an on-line service called the Economic Bulletin Board which diffuses information from several government agencies to various end users. Alternatively, BC places its data on a commercial database called CENDATA and makes it available to end users through the Dialog and Compuserv service bureaus.

- CD-ROMs - CD-ROMs are becoming more accepted in the field of dissemination efforts. CD-ROMs provide the capability to store larger data sets (667 megabytes) and are less costly than other currently available media. Most agencies have either recently introduced information in CD-ROM form, or are currently in the planning stage of releasing data or information on CD-ROM. NCI currently licenses rights to its information to 3 different companies who produce CD-ROM products. Likewise, NCHS and BLS both have CD-ROM products in development.

- Telephone - The majority of agencies accept inquiries through telephone requests. The users gain access through an 800 number or a direct line. There are several different mechanisms available to handle the verbal inquiries. Currently most requests are being processed by actual "live" operators who either re-direct the calls to an appropriate division, or process the calls themselves.

- Fax Technologies - Fax technology in general was not being used as a complete dissemination strategy. For the most part only office fax machines were being used for the transmission of memorandums, news releases, and other one time communications. However, two agencies, NCI and BLS have/or will implement an automatic fax response technology. NCI's system has been operating successfully since March of this year. BLS currently has the system in development.

It appears that in general most of the agencies are operating at about the same level in terms of dissemination strategies and technologies. An analysis of the current methods of dissemination used by NCES shows that the Center is at about the same level of technical sophistication as other government agencies. Several new methods and approaches were identified.

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5.2 Interviews with Commercial Contractors

5.2.1 Introduction to Commercial Contractors

Several commercial contractors were interviewed who have large scale information dissemination activities. The list includes:

- General Electric Corporation
- Compuserv Business Services
- Dialog
- GTE Corporation
- Copia International, LTD.
- Advantage Systems Corporation
- FaxBack, Incorporated
- Boeing Computer Services

Each of these private sector contractors have existing relationships with either the United States Federal or State Governments, with the exception of FaxBack, Incorporated, who is contracted by the Canadian Government. Each contractor was interviewed to identify the current and future types of products and services that are or will be extended to its customers. It is noteworthy to mention that since some of the contractors offer such diversified services, the following descriptions are brief overviews of the information gathered during the interview process.

Initially, on-line service bureaus, such as Dialog began to spring up as a result of a movement toward information technology. At start-up, these companies offered limited service, namely access to information stored on various databases. Over time, as computing capabilities increased, so have the services offered by these bureaus. Now the typical basic service includes various bulletin boards, electronic mail, and conferencing capabilities. Amongst the vendors contacted for this study, Dialog, Compuserv, General Electric Corporation, GTE Corporation, and Boeing Computer Services all offer services to access databases but each has differentiated itself through the addition of assorted technologies, subdivisions of the company or through niche marketing.

- Dialog - Dialog has chosen to build on its mainstream business by offering other related services such as the aforementioned capabilities (i.e., bulletin boards, electronic mail, etc.). One area of technological emphasis is the utilization of CD-ROMs. This CD-ROM service called OnDisc now supplements the on-line system. Using CD-ROM with either DOS or Macintosh workstations, an end user can do initial searches off-line, save them to a temporary file and upload the current search to the on-line system. Any current information contained on-line but not on the CD-ROM will appear on the screen. This enhancement is both time and cost efficient for the user since less time is spent on-line. Traditionally, a command search method was used to access information on the database. Recently, the system has been enhanced to provide the user friendly option of an Easy Menu Search. Increasing technological capabilities will lead the company to continue to make the system more user friendly and information access easier through vehicles such as fax technologies.

- Compuserv Business Services - Compuserv Business Services has divided itself into 3 distinct subsidiaries. These include the Information Services Division, the Network Service Division and the Software Products Division. Each of these divisions offer differentiated services to cover more of the requirements of their customer base. The Information Services Division provides a full-text database access similar to the services that Dialog provides. A recent enhancement to their current offerings includes the Message Handling System Gateway, which allows end users to access commercial on-line services such as Dialog by dialing into the Compuserv network and following user friendly menus. The Network Service Division supplies public data networks (i.e., local and wide area networks) which allow organizations to network across physical locations, both internal and external to the organization. Private forums (conferencing capabilities) are also available. These encompass three major communication tools; bulletin boards, data libraries, and conference facilities. Finally, the Software Products Division offers a database management system which is customized to work with fax technology. The package runs only on the DEC VAX but has the potential to interface with Compuserv networks.

Dialog and Compuserv both began in the on-line service industry. However, Dialog has grown into a large commercial company which targets the business market, while Compuserv focuses on the home use market. While Dialog and CompuServ began in the on-line information dissemination business and are expanding out, some already diversified companies are offering similar services in addition to their other businesses.

- General Electric Corporation - The Information Services Division of the General Electric Corporation offers an on-line service called GEnie which allows subscribers to access bulletin boards, databases, and other information sources. Many other information dissemination applications are also offered. One such application which is currently available is called BusinessTalk which is essentially an "empty shell" to be filled with information of the subscribing organization. The application utilizes databases, electronic mail, and bulletin boards and can be used to disseminate information internally, or externally through the public data network. The General Electric Corporation works with each of its customers to tailor the offered applications to meet their specific needs.

- GTE Corporation - The GTE Corporation has identified market niches and has specialized divisions designated to service these areas. For example, one division is totally dedicated to the field of education. Eight topical categories classify the databases in this field. They are Special Education, State Specific, Human Services, Education News, Reference/Research, Subscriber Assistance Technical and Universal Interest. Not only can a user access specialized databases, but they can participate in electronic bulletin boards of this network. These offer educators the opportunity to communicate with experts in each subject area. Each board covers a single topic and is maintained by an editor with expertise in the subject matter field. Further research revealed that GTE will be expanding into different areas in the future. One area under development is the broadcast fax function.

- Boeing Computer Services - Boeing Computer Services is not as deeply entrenched in the on-line information business as some of the other vendors. Currently a time sharing process is offered, where organizations can house information on Boeing's IBM mainframe. End users then contract system time to access the information. Other products offered include any technologies applicable to the functioning of a mainframe computer, such as tapes, or diskettes.

Several of the aforementioned service bureaus will set up and maintain databases at no cost to the information provider. This is a function of the ability of the vendor to make a profit based on the volume of access by the user community. Companies such as Dialog and CompuServ require a written proposal outlining areas of expertise, sample menus, and target markets. These proposals are reviewed by staff for potential revenue generation. For example, a database such as Standard & Poor's Corporate Register, which services a broad target market and has high projected usage, is accepted. However, if past trends do not show evidence of high market demand, the proposal is rejected. Statistical databases have historically shown low demand, therefore the request to put this type of information on-line would most likely be denied.

The remaining contractors consulted, namely Copia International, Ltd., FaxBack, Incorporated and Advantage Systems Corporation have a business focused in fax technologies.

- Copia International, LTD. & FaxBack, Incorporated - Both Copia International and FaxBack Incorporated offer interactive software that provides automatic fax response distribution through the use of personal computers, fax boards and a voice board. While fax technology is still relatively new many software vendors are springing up.

- Advantage Systems Corporation - A sector of service bureaus and software resellers are moving into fax technology as well. For example, Advantage Systems Corporation has expanded their mission from configuring computer equipment to offering service functions related to fax technologies. The configuration of the hardware and software required for an automated fax response service, or the complete operation of the service are available through this bureau and others like it.

5.2.2 Current Technologies Offered by Contractors

In summary, Dialog, Compuserv Business Services, GTE Corporation, General Electric Corporation and Boeing Computer Services all offer on-line access to commercial and privately held databases. As described above, varying degrees of additional technologies and services accompany the basic on-line information access service. These are furthered delineated in Figure 5-2. It should be noted that for each of these companies, the end user can download information from the mainframe to hardcopy/softcopy through a personal computer or fax machine given the appropriate equipment is available to the end user.

The General Electric Corporation, Compuserv and the GTE Corporation have further differentiated their services to include technologies from public data networks to fax technologies. FaxBack, Incorporated, Copia International, LTD., and Advantage Systems Corporation offer products and services that are in the arena of fax technologies. Further explanations of these technologies follow.

Figure 5-2 Government Contractors Dissemination Mechanisms

Dissemination Mechanisms	Contractors								
	NCES	GTE	Boeing	GE	Compu Serv	Dialog	FaxBack	Copia Inter-national	Advan-tage Systems
9 Track Tapes	X		X						
3480 Tapes	X		X						
Diskettes	X								
Elec. Bulletin Boards	X	X	X	X	X	X			
Information Network	X	X		X	X				
CD-ROM	X					X			
E-Mail	P	X	X	X	X	X			
Fax Technology		X		X			X	X	X
Telephone	X								
Custom Application				X					
On-Line Service Bureaus	X	X	X	X	X	X			

X = In use
P = Planned

**** NCES dissemination activities are charted independently of the services offered by the individual contractors.***

5.3 New Dissemination Methods

The purpose of this section is to define and explain the applications that would be applicable for dissemination purposes at NCES, that NCES does not currently have in operation. Any "new" dissemination methods that were identified and deserve attention are addressed.

After collecting information regarding the current types of dissemination methods, several methods that were different were identified. No exceptional "new" forms, or vehicles, for dissemination were discovered. However, there were new variations for applying the technologies that currently exist.

Those variations or applications that seemed to be compatible to the dissemination requirements of NCES were further researched.

The most notable method is in the utilization of fax technology. The applications that stand out, in terms of useability and compatibility to the requirements of NCES, are in the field of automatic voice prompting and response, and in automatic fax distribution systems. The following sections discuss:

- Automatic Call Answering Service
- Automatic Fax Distribution System

5.3.1 Automatic Call Answering Service

At several of the agencies interviewed, there is a noted shift towards the utilization of automated answering service systems. The automatic call answering service technology enables the manning of telephone lines to be discontinued. The user is able to access a data file through the use of a touch-tone telephone.

The automated call answering service is a voice prompting/voice response service. The automated call answering service was designed to work as follows:

(1) Call in and receive a menu (caller must have touch-tone service).
(2) Caller is given a set of options from which to choose.
(3) Caller selects the desired choice by pressing the corresponding keys on the telephone touch-tone pad.
(4) Caller is given the desired information or value in a recorded telephone message.

Data that are contained on the automated answering service must be specific information due to the verbal nature of the response. It would be most applicable for specific questions, not long research questions. The system can be set up to allow the user to browse through the available data or information, or skip to a specific request.

Currently, the voice on the service is a recorded script, not a computerized version. The information on the service can be easily updated, however it must be done manually. A computerized voice option has recently become available.

The system is useful for answering everything from administrative questions to specific requested information. The use of the voice prompting/voice message is being implemented at various other institutions. Currently it is in use for questions relating to banking inquiries, news information, and general employment update information.

The service does not require a large investment in equipment. The actual technology required is a PC with a voice board. The programmable software can be bought through various vendors. The service can also be provided through the service of a commercial vendor.

There are several commercial vendors involved in the application of the voice prompting/voice response service. The Bureau of Labor Statistics has this system in operation with the use of "Microlog". Microlog is a company located in Germantown, Maryland that provides the needed technological equipment to provide the service.

In addition, the utilization of the voice prompting feature integrated with an automatic fax response is a relatively new concept in dissemination methods. This service offers any user with a touch-tone telephone and a fax machine instant access to available information and documents. Instead of a voice response, the caller can choose the option on the voice menu to have the response made in a fax format. The following section describes the features of the automatic fax distribution service.

5.3.2 Automatic Fax Distribution Service

A fax distribution service or a fax-on-demand system is the union of a personal computer with a high capacity hard disk, a voice board and one or several fax boards or fax processing cards controlled by programmable software. Information seekers can call the automated fax distribution number and proceed through a simple personalized voice menu. The information seekers order their choice(s) of documents

by selecting them via the numbers on their telephone keypad. They may also order a catalog of available documents. If the one-call method of delivery is chosen, then the call must have been made directly from a fax machine, so the requested information can be sent immediately. If a two call delivery method is chosen, the system prompts the caller for a fax number and then initiates the phone call to the designated fax machine. The former method forces any phone charges onto the customer, while the latter causes the automated fax distribution owner to absorb any telephone charges.

Additional features of the automated fax distribution service include passcode capabilities which enable certain documents to be accessible only if the password is known, fax telephone number validation is completed before any fax is delivered, and different geographical configurations are available to open the service for local, national or international calls depending on the owners' preference.

Implementation of the system is relatively simple. At the National Cancer Institute, one programmer had the entire responsibility for the system in addition to other responsibilities. It took only a 3 month period to get the entire system debugged and running. It was estimated that this time frame could be reduced by 75% if it were an individual's sole responsibility.

Documents can be placed into the automatic fax distribution system through a number of methods. Documents can be downloaded from a mainframe or accessed from anywhere on a local area network. They also can be scanned into the system through the use of a flatbed page scanner such as the HP ScanJet. Updating the system can be done in three different ways; through a simple program which downloads any new information, scanning, or actually faxing information to the system.

Additional features of an automated fax distribution system include:

- Marketing feedback is provided by the system through detailed activity and system performance reporting capabilities.
- Broadcast fax gives the system owner the capability to set up a distribution list of individuals or companies that own a fax and have an interest in obtaining documents. The information is then sent to all interested parties at a date and time of preference.
- Tools of industry standard databases are provided to enable system owners to access information for applications such as account number validation, or custom document delivery.
- Multi-lingual support allows a system to be set up in 8 different languages, each with its own voice prompts, cover sheets and documents.
- Credit charge capabilities allow a system owner to charge fees for the documents provided.

5.4 Overview of Findings

NCES currently serves a diverse population of users. The user community includes researchers, analysts, educators, policy makers, the commercial business community and the general public. The wide variety of user types has a broad range of information needs coupled with various levels of technical capability. Format needs include the requirement for raw data, tabular data, graphic presentations and textual information. In order to satisfy the requirements of the user population, NCES employs multiple schemes for disseminating information, ranging from distribution of paper publications to maintaining electronic bulletin boards.

An analysis of the Government sector shows that the Center is keeping pace with the forerunners with respect to dissemination technologies being employed by other Government agencies. NCES is utilizing most of the newer dissemination vehicles currently employed by the other agencies contacted, such as electronic bulletin boards, information networks and compact disc technology. However, there is room for improvement with respect to implementation of current technologies, and the development of strategies for incorporating new and evolving technologies.

SECTION 6. EXPERT OPINIONS ON TECHNOLOGICAL TRENDS

The purpose of this section is to relate the opinions of experts regarding new or emerging technologies which may be applicable to NCES information dissemination planning activities. The identified trends fall into the broad classifications of:

- ***Improvements in Storage Media***
- ***Advances in Transmission Vehicles***
- ***Advances in Information Manipulation***

While it is difficult to provide absolute statements about the future of technology, it is constructive to gather insights of what may be expected in the coming years. The following is a consolidated summary of the knowledge and opinions accumulated through interviews with 26 experts in the fields of data dissemination, computers and technology. This synopsis is intended to provide a general understanding of some of the most prevalent trends identified by the selected group of experts. It is not an exhaustive study of all technological developments and applications. Only those technological trends of the next five years which may, upon further analysis, be applicable to the distribution of NCES data and information is detailed in this section.

In order to gather information regarding future dissemination technologies and their applicability to NCES, three methods of information gathering were used. They included face to face interviews, phone interviews, and literature searches. To qualify for interview, an individual must have been identified as an expert by an NCES representative, another expert, or otherwise shown in depth knowledge of state of the art technology and its application.

The new technologies that were identified have been grouped within three broad categories. The main categories include, storage media, transmission vehicles and information manipulation. Each particular technology within a category is discussed independently by defining the technology and discussing its possible applicability to NCES.

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6.1 Storage Media

Different forms of optical and/or combinations of magnetic and optical media are forging another path in the mass storage arena. As more alternatives become available the decision of how to store data and information for dissemination becomes more complex in terms of meeting user requirements.

Storage media, while not active distribution mechanisms, play an important role in a dissemination strategy. Unless on-line databases or networks are the only dissemination vehicles used, data and information must be made available in some form of physical storage medium. The method of storage chosen is contingent upon the needs of potential users. It is also a function of the fit between the type of information to be stored and attributes of the storage medium. For example, it is possible to puts rows of raw statistical data on video tape, but the probable use of the data by anyone is minimal.

Many types of the media have been available for a number of years but recently optical storage has forged a new category. The focus of this section is to explain various types of optical storage which are or will be available in the coming years.

Variations of storage media which are read by a laser, or a combination of laser/magnetically read media were introduced to the mass market in the 1980s. Optical storage is loosely defined as any medium which is read by a laser. This definition encompasses many variations of technologies which fall into the following categories:

- CD-ROM (compact disc, read only memory)
- Magneto-Optical Discs
- Holographic Storage

Features of laser/optical storage include both analog and digital coding of information. Historically, voice transmissions were carried through analog signals and most other data were carried through digital

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signals. Currently, digital coding has become more predominant, even in the area of voice transmissions. This general trend toward digital encoding of information is expected to continue.

6.1.1 Compact Disc, Read Only Memory (CD-ROM)

Although CD-ROM technology was addressed in the first part of this document, some new hardware developments which accompany this technology are worthy of mention. The incorporation of local area network (LAN) solutions which maintain multiple CD readers on a file server and the development of jukeboxes are increasing the user population served. "Jukeboxes" are mass storage machines that hold multiple compact discs. Such machines can support approximately 3 gigabytes of information. In terms of the NCES user base, a potential application may be to develop a series of CD-ROMs which can be sold individually or in a set to organizations in need of knowledge in specific areas. The users could then keep archives of past documents and also keep current NCES data without the worries of space requirements presented by printed publications. Another alternative may be for NCES to produce a CD Jukebox system with a library of all its documents. Then make the library available for users to browse in an on-line mode.

Another advancement in CD-ROM technology is the Sony Data Discman which is projected to be available in 1992. The Discman is a hand held piece of hardware which houses a 2" x 2" CD-ROM drive that is located under a keyboard. Information contained on the CD-ROMs can be uploaded to a larger computer either directly or via the telephone. This type of equipment is more applicable to NCES users, if more interpretative information is generated since the device is focused on providing quick reference to textual information. The Data Discman could be invaluable to NCES users such as policy makers or educators who need to have easy access to NCES information in a timely manner.

6.1.2 Magneto-Optical Storage

Another category of the storage media classification is referred to as magneto-optical storage. This technology is functionally similar to CD-ROMs but it also has the capability of being fully rewritable. To achieve the capabilities of both writing and erasing, the Sony Corporation developed a magneto drive which operates on the principles of thermomagnetic recording. A laser combines with a biasing magnet to change the magnetic orientation of the disk's recording layer. In effect, the principles of magnetic storage are integrated with laser technologies to produce an upgraded vehicle of storage. The average search time for information retrieval is 95 milliseconds. That means that 2 megabytes of data can be

located in less than 22 milliseconds. The actual disc is packaged in a protective cartridge to safeguard the optical disc from scratches, fingerprints and dust. These discs are available in two sizes a 5.25" disc which can hold up to 650 megabytes of information and a 3.5" disc which can house 128 megabytes of information. This medium, because of its similarities to the CD-ROM, can be used in many of the same ways which NCES uses CD-ROMs. Also, because of its rewriting capability, it has the added value of being reused and allowing the user to add additional information to their discs.

6.1.3 Holographic Storage

Finally, a futuristic optical medium is holographic storage. This medium is laser read and incorporates the use of three dimensional cubes of strontium barium niobate crystals. Laboratory experimentation with the concept of holographic storage has been going on since the 1960s. Recently, scientists have become hopeful of its emergence as a legitimate commercial storage medium. A prototype has been planned for 1992. Holographic storage is superior to a regular disk drive in terms of the way information is stored and retrieved. Disk drives store or retrieve a single bit (binary digit) at a time, whereas holographic storage systems store an image which consists of thousands or millions of bits at a time. An additional problem with disk drives is that they have moving parts. This means that many thousandths of a second are needed for the recording head to reach a particular spot on the spinning disk. Holographic storage requires no moving parts so lasers can find the needed data in as little as a millionth of a second. Although holographic storage has superior characteristics, it may never catch up to disk drives because disk drives and semiconductor chips continue to advance in storage capacity and become less and less expensive. In the future, holographic storage may be useful for the transmission of audio and visual information. In terms of NCES information dissemination needs, holographic storage may be very applicable in the future especially if the Center moves toward the generation of textual/visual or interpretative information.

6.2 Transmission Vehicles

This section addresses forthcoming advancements of transmission vehicles. Trends in the 1990s indicate that more wide area communication networks will arise to facilitate the transfer and dissemination of information on both a national and international level.

Networks connect together all types of computers and computer related peripherals such as terminals, printers, and modems. Networking computers is a practice that has been employed for many years. In recent years, the volume and sophistication of networking has risen sharply. Current capabilities to link numerous computers regardless of their manufacturer have resulted due to the establishment of architectural and protocol standards. The ability to network computers has given rise to many value added services for information dissemination.

6.2.1 Supernetworks

Supernetworks, or information highways as they are sometimes called, are currently providing nationwide interconnectivity. The development of supernetworks, or networks which connect thousands of sites globally, has been made possible by advancements in disciplines such as fiber optics. Currently, a futuristic government funded network, namely the National Research and Education Network (NREN), is in progress. The infrastructure of this network is a familiar one. NREN is really an upgrade of the current Internet system which grew out of NSFnet.

NREN is a fiber based system designed to link approximately one million computers at over 1,000 libraries, universities and businesses across the nation. This "superhighway" is devised to have the capacity to send billions of bits of data per second. That means that users can exchange information at the rate of 50,000 single spaced typed pages per second. These speeds are over 1,000 times faster than most of the data networks in existence today. When finished, NREN will allow researchers, businesses and students nationwide to communicate with each other. Additionally, a broad range of research tools and information resources will be available such as user support and training, directories of users and

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databases, electronic journals and books, electronic tools and database access to commercial information resources and services.

A natural fit between the types of services which NREN is establishing and the dissemination needs of NCES is present. NCES might organize hypertext databases of both statistics and textual information for inclusion on NREN. Additionally, NCES could take advantage of bulletin boards and electronic mail which the network offers from both an information gathering and information distribution perspective.

In summary, as time progresses, the number and size of information networks will increase dramatically. Information networks of the future will be completely digital and governed by computers. The networks will have enough intelligence built in to handle almost any kind of routing or diagnostic problems, protocol conversions and software emulation. Those who wish to provide their message to a large audience should consider the possibility of connecting to major network systems.

6.2.2 Cable Television Transmission

The implementation of the Integrated Service Distribution Network (ISDN) may also have an impact on data dissemination. The ISDN is currently in place in Europe and is being implemented in some of the larger cities in the United States. The ISDN provides a high speed path for linking data together and allows the transmission of both video and computer data. A typical product ten years from now may include the marriage of television, computer, and telephone. While these developments may seem too removed, current innovations in the cable television networks are more viable.

Currently, transmission of both interpretative and statistical information can be achieved over vacant cable channels. The transmission of interpretive information via closed news casts or talk shows may be increasingly important if the country focuses on educational use of the television. Actual statistical data can be placed on vacant cable channels. Essentially, rows of statistics could roll on the screen. NCES would have to make announcements as to the time and channel of various study's statistics. School administrators or organizations can then either directly or remotely download the information from the television to a microcomputer via a modem. The users can then manipulate the statistics or information via software on their own computers.

6.2.3 Fax Technology

Continuing developments in fax technologies will include supplementary applications, the introduction of color, higher quality facsimiles, and lower associated costs. One of the existing applications of fax technologies includes the automated fax distribution system discussed in Section 5 of this report. Representatives from the Research Triangle Institute and the New York Network commented that the implementation of fax technology was useful if the information from the system was in textual or interpretive format, was amenable to the users, and enough of the user population's generalized issues of concern were identified and addressed. Short documents, such as summary reports, or pamphlets and flyers developed by NCES could be easily transmitted through an automated fax system.

Other developments include fax boards which allow a user to send and receive faxes from a personal computer, including faxes sent directly to/from electronic mail and electronic data interchange. A unique service that has been developed by Searchcraft, Incorporated includes an on-line service bureau which incorporates facsimile functions into the traditional offerings. Specifically, a user can dial into the on-line database and request a topic to research using the letters on their telephone keypad. The system allows the user to further define his search and at the end of the session tells how many entries were found matching the search and asks the user if he would like to receive the information via fax. This technique is really a substitute for an on-line information database. In reference to NCES products, any textual information which could be placed on a database could also be connected to a fax system such as the one described.

6.3 Information Manipulation

This section addresses technologies or trends which allow the user to more easily work with and manipulate the data and information that is made available by NCES.

Advances in the areas of storage and transmission will make increasing amounts of data and information available to a larger population of users. An increasing number of users will be non technical as the

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audience for NCES products expands. In order to ensure maximum utilization and availability of the information new means of access and manipulation must be devised.

6.3.1 CD-ROM Data Access Software

CD-ROM was previously discussed with respect to its data storage qualities. Another aspect of the CD-ROM technology relates to the accessibility of the information on the disc. Access to data on a CD-ROM is a function of the front end retrieval software which is provided on the disc. Providing raw data on a disc in standard file formats without software retrieval capabilities is only useful to the most sophisticated data users who can download the data to their own systems and then manipulate it. There are a variety of software packages now available which facilitate access to textual information presented on CD-ROMs but very few which cater to the retrieval of statistical data. Currently, the commercial sector is focused on text retrieval software, rather than retrieval software for statistical data.

As NCES moves forward with its production of CD-ROMs it must address the need to provide text retrieval software if the CD-ROMs are to provide textual information. It must also recognize that if it expects large segments of the population to use the data files and statistical information provided on CD-ROM, NCES must be committed to developing the front end retrieval software to facilitate access to the statistical data.

6.3.2 Hypertext Database Structure

With respect to textual information, the term "hyper" connotes the concept of linking together information that otherwise may not have been connected, i.e., non-linear coupling. Hypertext databases allow a user to extract information to answer queries that range from the very broad to the very specific. Hypertext documents contain tags which identify title, paragraphs, indexes and other items. The text search software can then review indexes and tables of contents based on the tags and link the tags across multiple documents. Hypertext uses a hierarchial organization which provides the capability to access general overviews of information but also allows the user to click on specific word and pull up information from different documents to answer specific questions. A hypertext set up of an NCES database might allow various categories of users to relate and extract data and information in an infinite number of combinations.

6.3.3 Multimedia

Multimedia, as the name implies, is the use of more than one communication medium. Multimedia applications can include any combination of video, sound, text, animation, and graphics with a computer to tie the components together. Multimedia incorporates such technologies as videodiscs, CD-ROM, video cassette recorders, television, video cameras, printers, and digital sound. Variations of the previously mentioned optical storage media, in combination with some other hybrids in the field of data storage have enabled advancements in this arena. Currently, a good fit between NCES information dissemination needs, users and multimedia functions does not exist. In order to utilize this type of application, NCES would have to move into more visual, interpretative presentations of the statistics produced. One example of such an application may be to create a documentary style of video of the *High School and Beyond*. The narrator might describe the study and explain the statistics through charts and graphs, and further capture the attention of the audience by showing taped interviews with high school students which illustrate key points.

6.4 Other Technological Identified

A sampling of some other technologies which are or will be developed in the future, but are not necessarily applicable to the dissemination needs of NCES over the next five years include:

- Electronic Data Interchange
- Voice and Video Teleconferencing
- Other Advances in Optical Discs
- Neural Networks.

Electronic data interchange is the automatic transference of information via computers. Typically, information contained in standardized forms such as purchase order request forms can be electronically transferred. Therefore, creating a "paperless" office environment which permits faster turnaround and greater accuracy of crucial documents. While this technology has many associated benefits, it is limited to the exchange of information contained in standardized forms. Any document requiring flexibility in layout is not appropriate for an electronic data interchange system.

Another developing dissemination technology identified is teleconferencing, with both video and voice capabilities. Teleconferencing is an interactive approach which allows people at various sites to

communicate more effectively. Aside from use for traditional meetings, teleconferencing has been used in other innovative ways. For example, a variation of this technology can be used as a means of collecting large amounts of survey information within a short time frame. Specifically, large meetings at multiple sites can be arranged via a commercial teleconferencing center. Each incumbent of the meeting is seated in front of a computer to type in responses to the survey questions on the screen. Responses are then tallied automatically via the host computer. While this is concept with many benefits, it was not deemed appropriate for regular dissemination methods of NCES.

Other advances in optical disc technology include compact disc integrated (CDI), digital video interactive (DVI), and CDTV. These are all advancements to CD-ROM technology. CDI which was announced in October of 1991 has the capability of supporting some motion. DVI which is currently has limited availability can support full motion video on a disc. CD-ROM technology is the most appropriate form of optical discs for the dissemination of statistical or textual information. The other variations, CDI or DVI will only be useful to NCES if the format and presentation of its products is changed.

Another developing technology of the future (approximately 20 years from fruition) is the concepts of neural networks which will work in coordination with the software development of "knowbots" and personalized agents. Essentially, these machines will emulate the processes of a thinking human brain. They will have voice and pattern recognition capabilities and will actually learn through trial and error. In the future, when neural networks are fully developed, they may be extremely useful tools for researchers. For example, researchers who generate and analyze statistics could use the capabilities of a neural network to develop statistical models or otherwise assist in their work.

While information on these and other developing technologies was collected, applicability to NCES was viewed as limited. Therefore further in-depth analysis was precluded.

6.5 Overview of Findings

Section 6 of this report has presented new and evolving technologies which experts feel may be applicable in the development of a data and information dissemination strategy for NCES. The interviews with experts provided several radically new technologies which might be applicable to NCES. In addition to the identification of specific technologies, the interviews surfaced trends in the development of technology

which should be considered in any long term planning. The trends identified through the interviews addressed three major components of the information dissemination and utilization arena. They are:

- Storage;
- Transmission; and,
- Manipulation.

The trend in storage continues to be the reduction of the physical size of the storage device with an increased volume of storage capacity. CD-ROM and holographic storage are examples of this trend. As a producer of large amounts of statistical data, NCES must be concerned with employing cost efficient and utilitarian forms of data storage. The chosen forms of storage must take into account both the internal utilization of the data and the storage device requirements of the users of NCES data.

Transmission of information both nationwide and globally is quickly becoming cost effective and thus, commonplace. Connection to national networks such as NREN or access to commercial cable systems may be important routes by which NCES expands its user audience. The trend toward making information available to vast and unknown audiences through major transmission networks may fit into future NCES plans should it choose to provide more interpretive information rather than strictly statistical data to the general population.

Ease of data manipulation will become increasingly critical as the general population gains greater access through more sophisticated transmission technologies. Front end software on CD-ROMs and the utilization of hypertext will both serve to facilitate user access to information. Futuristic technologies such as knowbots and personalized agents may have a large impact on the utilization of NCES data. Such systems will facilitate the users ability to take NCES data and create models and statistics that are unique to their own individual needs.

The second phase of this project served to gather expert opinion regarding emerging technologies which may be applicable to the NCES data dissemination strategy. When analyzing the possibility for the use of new techniques it is important to remember that technology permits change, it does not force it. State of the art technology is ineffective if users cannot or will not utilize it. Therefore, the implementation of any of the aforementioned technologies must be considered with the eventual user in mind.

SECTION 7. USER REQUIREMENTS AND PREFERENCES

The purpose of this section is to relay the needs and requirements expressed by 50 "major" users of NCES data and information.

This section addresses the following user requirement topics:

- Desired data/information formats;
- Current and desired physical vehicles of dissemination;
- NCES "major" user recommendations.

One of the main functions of NCES is to supply educational information to a diverse user audience. NCES must decide on the way(s) to best meet these demands. The previous section looked into new or emerging technologies that may better serve the user population in the future. However, for any new technical dissemination method to provide utility, it must correspond to NCES user requirements. Many factors must be considered in order to determine which strategies and technologies will best serve such a diverse audience. In addition to technology, a major component of the NCES strategy is based on the needs and requirements of the "consumers" of their products. The following section discusses the findings from interviews with 50 users of NCES data and information.

7.1 Background Information and Issues

There are a variety of factors which influence the development of a data and information dissemination strategy. With regard to the "user" component of a dissemination strategy for NCES the following areas come in to play:

1) NCES dissemination objectives;
2) User data and information requirements; and
3) User technical sophistication and capabilities.

The following subsections further define these "user" issues, which will establish the framework for the dissemination strategy.

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7.1.1 NCES Dissemination Objectives

Since the composition of the target audience drives the direction of the information dissemination strategy, it is critical for NCES to have a clear idea of who its target audiences currently are and, who they might be in the future. For example, if the primary target for NCES data is the education research community, the dissemination strategy would be focused on providing mostly raw data in some magnetic or automated format. Conversely, if the primary target is perceived to be the parents of school-aged children, the strategy might tend toward textual pamphlets and small analytical studies. At present, NCES holds conflicting viewpoints of who its current and potential users are. NCES needs to establish a standard definition of its target audiences.

NCES is mandated to provide useful, high quality data to Congress, the Executive Office (which includes the Office of Management and Budget (OMB)), and the general public. As stated in the NCES Proposed Mission Statement, the Center's activities are designed to: (1) address the high priority education data needs; (2) provide consistent, reliable, complete and accurate indicators of education status and trends; and (3) report timely, useful and high quality data to the Department, the Congress and other education policy makers and data users inside and outside government. Currently, two major target audiences for NCES data and information include education associations, and the research community.

In addition, there is a move within OERI to serve a much larger education community. Diane Ravitch, Assistant Secretary for Educational Research and Improvement, prepared a memorandum (dated August 26, 1991) containing some preliminary objectives in this area. This memorandum states that the effectiveness of OERI as an agency "depends on our ability to target our audiences and to deliver the knowledge and information that they need to improve education. Therefore, every program, every activity must be scrutinized for its ability to assist and inform teachers, parents, students, administrators, and policy makers of education."

There is much internal debate within OERI as to the composition of the target audience. Clearly some assumptions must be made about the target audience in order to set a baseline from which a dissemination strategy can be developed.

During the interview process it was determined that there is a large "potential" user community which needs to be more clearly identified. This matter is addressed peripherally throughout this document, however, as the purpose of this study is to evaluate the needs of current "major" NCES users. The

information dissemination recommendations presented in Section 9 take into account the needs of the current user population, while positioning NCES to address the larger "potential" community in the future.

7.1.2 Data/Information Format Requirements

The kind of information being utilized by the user population must be analyzed to achieve a comprehensive understanding of NCES dissemination objectives. Earlier in this document, NCES data formats were presented. These include (1) raw data sets, (2) tabulated data, (3) visual/graphics, and (4) textual information. In developing a dissemination strategy, the level of demand for the different format presentations must be assessed. Associated with each of these data formats are certain unique considerations regarding the various mechanisms required for effective dissemination. For example, an extremely large data base, such as the NAEP data, would involve different dissemination objectives than a small data set composed of 10 statistical statements focusing on a specific issue. Knowing the needs and desires of the user community, with regard to data formats, impacts NCES' dissemination strategy.

7.1.3 User Technical Sophistication and Capabilities

Any dissemination strategy must take into account the technical sophistication and capabilities of the target audience. Providing NCES data on CD-ROM does not benefit users who do not have a CD-ROM reader. Projected utilization of new technologies is a function of:

1) Technical sophistication of the target audience;
2) Availability of funds to acquire associated equipment or services;
3) User friendliness of the technology; and,
4) Inclination or desire for the technology.

Technical sophistication of the user population plays an important role in determining the array of technologies to employ. The diversity of the user population, ranging from statistical analysts to executive policy-makers, requires a broad range of delivery mechanisms. Less technically "sophisticated" users of NCES data may be satisfied with paper documents; others may require complex, on-line technologies.

The current and projected availability of "new equipment" (hardware and software) funds is another consideration in developing NCES dissemination strategies. The rate of change in the user community's ability to accommodate new technology, especially for those technologies requiring dedicated or special purpose hardware or software, is clearly dependent on the current fiscal climate. As CD-ROM readers may not be available to a large segment of the education population due to severe budget constraints, less rapid change in the means of dissemination may be required.

User friendliness of any technology is the key to its utilization. As NCES seeks to reach a broader audience, technically simple means of information dissemination must be employed. This does not mean that sophisticated technology should not be employed. It only means that the complexity should be transparent to the end user. The user community should have to invest minimal effort to learn and adapt to the new technology. NCES should develop products that create a "user-friendly" interface between the technology and its user, if it wants to better serve the needs of its diverse user population with sophisticated information dissemination technologies.

Finally, users must have an inclination or desire to use delivery methods that are more advanced than what they are currently utilizing. Technology for the sake of technology, serves no purpose. During the course of interviewing NCES information users, it was found that some people use only paper documents, and no kind of on-line technology or CD-ROM technology is wanted or would be considered. Conversely, other users demand the use of higher technology for the dissemination of NCES information. To understand and serve the global user community, the needs of all NCES user groups must be considered.

7.2 The NCES User Community

Further analysis of the user population provided a more refined picture of user interrelationships.

7.2.1 Definition of NCES User Community

As part of the initial analysis in Phase I of this study, the NCES user community was defined as consisting of five clusters based on their access to and utilization of NCES data and information. These initial five groups were introduced in Section 2 of this document; they include Researchers/Analysts, Policy Makers, the Commercial Community, Educators, and the General Public.

As a result of information gathered during Phase III of this project, it was determined that these five categories are not fully indicative of the NCES user community. Although the five group classification is a reasonable construct, two useful extensions were identified. They are:

1) The Educators category needs further differentiation, and

2) The groups are interdependent rather than cleanly segmented from one another.

Upon completion of the user interviews, it became apparent that the Educators category presented in Section 2 needs to be further defined. This is due to the different requirements that were identified among the current NCES users who were sampled. There surfaced two distinct audiences in the education arena for NCES information. One group is comprised of organizations that facilitate the use of education information, while the other category consists of administrators and practitioners of education. These two separate audiences are defined with regard to their utilization of NCES data and information in more detail in the following section.

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From the interviews it was also discovered that the five user groupings presented earlier in this document do not function independently from one another, i.e. is not a mutually exclusive classification. For example, Researchers/Analysts can be found within the Policy Making and Educators categories. Thus, a more in-depth analysis of the NCES user community uncovered more detailed representation of the relationships among the user population and NCES data and information.

The general definition of each major group is discussed separately below. The definitions allow for manageability in referring to the general groups of user types. The groups have a certain degree of overlap, which shall be discussed later. With the splitting of the Educator category into two separate categories there are now six distinct user audiences that utilize NCES data and information. These categories are defined as:

- Education Associations/Organizations - This term is defined to include non-profit organizations providing services to the field of education. These associations are "repackaging" NCES data and information into newsletters, reports and pamphlets that are passed on to specific audiences. These associations act as repackagers, middlemen or facilitators of NCES information. For example, Education Research Services (ERS) incorporates NCES data and information into monthly bulletins, studies and reports which are distributed to administrators of academic institutions and school districts.

- Educators - These users include K-12 and Postsecondary administration and practitioners. The K-12 administration includes such entities as school boards, school districts, and local school administrators. The K-12 practitioner is the teacher of elementary/secondary education. The Postsecondary user arena also includes administration and practitioners of education. This segment is comprised of college administrators and professors. The Educators category is split into many different levels of which there are varying degrees of need for information. This category is a large "potential" audience for NCES information.

- Research Community - The research community works with numbers and manipulates data. They conduct their own analyses and generate interpretations of data provided by NCES. They perform in-depth statistical work on data and create new information. The research community is almost entirely overlapping with the other constituencies excluding the General Public.

- Policy Makers - This segment includes the Federal and State decision makers and legislative people. It includes politicians, Government agency executives, and regional and state governments and boards. The congressional legislative bodies that influence policy making decisions for the nation's education policies are the core of this group.

- Commercial Community - Is defined as any for-profit organization whose business activity is related to the education arena. This includes large and small businesses and industries, such as school supply and equipment organizations, or textbook publishers. This user segment follows education information closely to strategically plan their operational activities. Generally, their needs are for summary information which includes trend and forecasting analysis.

- Concerned/Interested General Public - This segment includes concerned parents, students and community leaders. The NCES mission statement identifies the general public as part of the user audience that is to be served. One of the objectives of the America 2000 initiative is to make information more available to the general public. One of the goals of the plan is to make the general public, which includes parents, students and community leaders, aware of how research can improve education. The intention is for every parent in America to have access to education information in order to make every child "ready for school." As part of these programs, the general public may become more interested and involved in obtaining education information. Currently, the general public appears to be only occasional, indirect users of NCES information. They are exposed to information provided be NCES through such sources as newspaper articles, brochures, magazine articles, and news broadcasts. Concerned parents may also occasionally search for information regarding specific "quality" issues. These issues may relate to the quality of education in a particular locality, or the characteristics of educational offerings within a certain school district. This general audience may indeed be a major direct user audience of NCES information in the future.

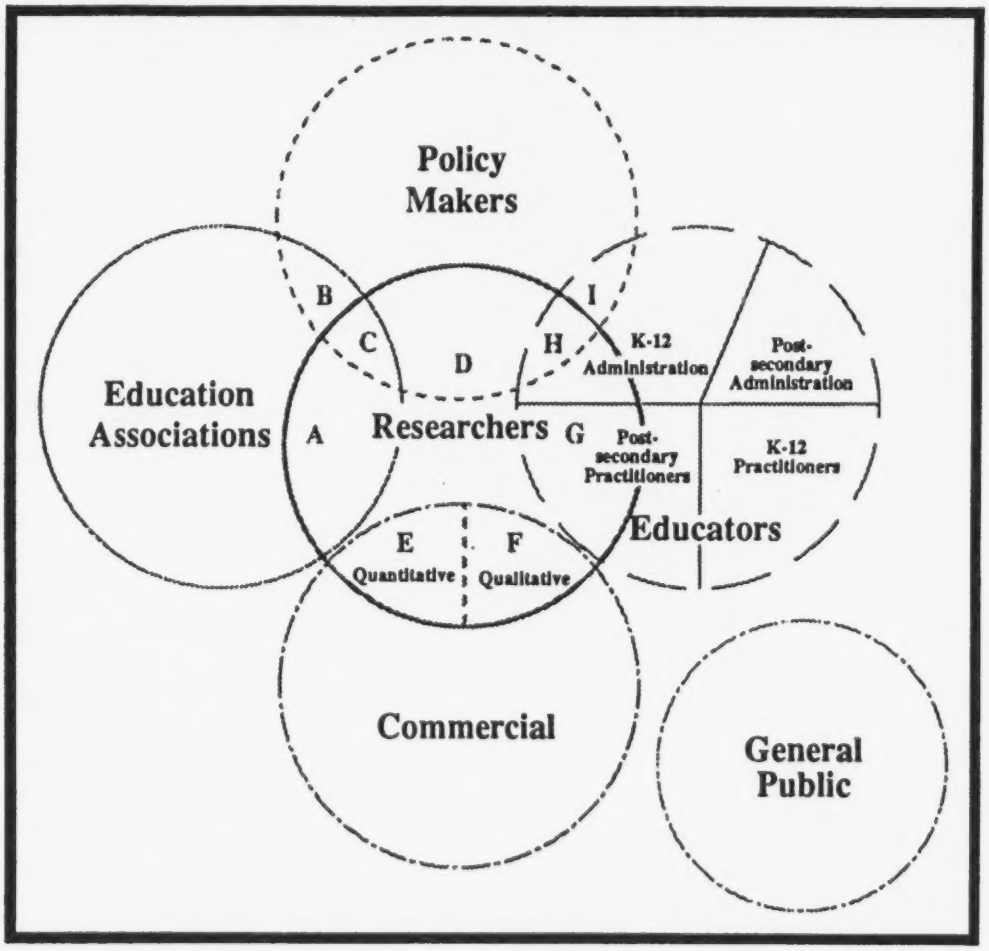
The only user category that stands distinct is the Concerned/Interested General Public. There appears to be very little direct use of NCES data and information within this category. However, this is a group that deserves mention due to the size of this audience and their fit into the mission of NCES to diffuse information "among the people of the United States". They are also considered to be a large "potential" user population.

7.2.2 Interrelationship of the NCES User Community

The six groups defined above were developed from the in-depth analysis of the NCES user community. The six groups are responsible for all of the different user requirements identified. Within each category, there exists diverse requirements for the utilization of NCES data and information.

The first five categories defined above do not stand independently from one another. Actual users tend to fall within two or more of the major categories. The relationship of these user categories are represented in Figure 7-1.

FIGURE 7-1 THE NCES USER COMMUNITY



Where the overlap exists, different user responsibilities occur and different requirements for NCES data and information arise. These nine different segments are identified in Figure 7-1 and are defined below:

Segment A. **Education Association/Researcher** - These users of NCES data and information have a more of a "research/analyst" function within their education organization. They are oriented toward generating their own reports and analyses to support their cause or area of interest.

Education Associations often channel their information into Policy Making bodies. Two segments of the Education Association/Policy Maker overlap are:

Segment B. **Education Association/Policy Maker** - This segment functions as a channel for education information to legislative bodies; they require more "information" as opposed to raw numbers. They function at more of a "management" level and are more heavily involved in addressing policy issues and promoting particular agendas.

Segment C. **Education Association/Policy Maker/Researcher** - This area includes data users that act as analysts and collect different data and information to satisfy a legislative request. They research different topic areas and perform their own analyses to include in a report or document. They are defined as being at a research "staff" level.

In a more specialized role in the Policy Maker category, there is a distinct NCES user audience that functions as:

Segment D. **Policy Maker/Researcher** - This group is not defined in the context of the Education Association category, but rather as a special area assigned to education research for congressional bodies. These users are the "Congressional Research Staff".

The Commercial Community overlaps with the Researcher/Analyst function creating two subgroups. There are:

Segment E. Quantitative Commercial Researchers - These users transform data into information through analyses. For example, this would include a Market Research Department within a for-profit organization, such as IBM.

Segment F. Qualitative Commercial Researchers - These users operate in a "research" role searching for information, rather than data. A prime example of this type of user is a reporter for a newspaper.

Within the Educator audience there are three different requirements for the use of NCES data and information. The three different roles that can be present among the Educator community are:

Segment G. Educator/Researcher - The users of NCES data and information that fit into this segment are Postsecondary professors involved in research for their own advancement and to benefit the university with which they are affiliated. Also, the end use would be to improve college and university offerings.

Segment H. Educator/Policy Maker/Researcher - This segment is primarily made up of the K-12 Research Administration. These users are in research positions responsible for doing testing and evaluation for local school districts and for doing comparative statistical analysis. These users create reports on the status of their associated school district at both a state and national level.

Segment I. Educator/Policy Maker - This segment includes such entities as school boards, school districts, and local school administrators who seek information on the welfare and education of children. Local policy and funding decisions are based, in part, on evaluative education information.

As was discovered during the analysis of the user community, there are a variety of subgroups of users within the major user categories. It should be noted that the general public is not depicted as overlapping with any of the major categories in Figure 7-1. The general public may get bits and pieces of education information from the other major groups as ancillary fallout. For example, education statistics generated by NCES may be utilized by politicians in campaign or policy speeches. Education Association representatives may present statistics at Parent/Teacher Association meetings. These are indirect sources of NCES information for the general public. Since the general public is considered to be a potential user of NCES data, and, at present has no solid, identifiable link to any of the other major user categories, it is set off as a lone category.

The user community that is represented in Figure 7-1 represents the entire NCES user community. This education information community consists of both current "major" users and "potential" users of NCES data and information.

7.2.3 Functional Relationships of NCES User Segments

The user community's needs can be defined into several different groups based on their manipulation and utilization of NCES data and information. The user community can be broken down based on the different roles they play within the education community and their

From analysis, it became evident that there are different ways in which users among the various groups presented in Section 7.2 were utilizing NCES data and information. Three distinct uses of NCES information by the user community emerged. A user is categorized into a certain usage capacity based

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on their objective for utilizing the information provided by NCES. Users can take on functions of (1) Researcher, (2) Repackager, or (3) End User.

The various functions that the user groups perform are defined as follows:

> Researcher - Function in the role of creating new information from raw or tabular data that they receive directly from NCES. The Research Community generates information which is channeled to their specific education information target audience. Information is created from NCES data and information to satisfy the needs for summary or trend information of corresponding audiences. For example, the Policy Maker/Researcher performs analyses on raw data or tabular data to respond to a particular legislative request from the Policy Maker segment. From an analysis of the user community, and as a result of the search for "major" users of NCES data and information, it became evident that the largest population being served by NCES is the Research community. From the sample of users, 34 worked in some research capacity.
>
> Repackager/Middlemen - Act more as facilitators or middlemen to help promote and disseminate NCES data and information. This includes the different organizations defined within the Education Associations. This group utilizes NCES data and information and tailors it to respond to education issues. Within this category there are different degrees of format requirements, due to the differing levels of analysis sophistication and the end user's technical level of "understanding". From the analysis, 16 of the users sampled were involved in a "middleman" position.
>
> End User - This audience uses education statistics and information that has been tailored to serve their specific need(s). NCES information is channeled to this audience in a "summarized" or "clarified" version that has been prepared by an education association or researcher to respond to specific issues or requirements. For example, the users that fit into this segment may be in a Policy Making position and need certain education information to support a decision regarding local school district funding. In general, the Educators Segment is also currently operating in this category. Therefore, most of these users are receiving NCES information indirectly from other education organizations. These end users not only receive information due to a specific request for information, but in the case of the general public, they may also obtain it through news articles or broadcasts.

It is important to analyze these three various functions that NCES users are currently performing. It is important to understand these because it impacts the dissemination process of NCES data and information. By identifying the ways in which information is utilized, and the relationship established in regard to NCES information, the flow of NCES data and information dissemination becomes evident. Currently, NCES is providing the statistical data base for which external researchers and education groups are providing the analysis on the information, and then this information is channeled to the education decision makers and interested public.

7.3 NCES User Interviews/Overview of Findings

The following is a consolidated summary of findings developed through interviews with 50 "major" users of NCES data and information.

Fifty users were identified and interviewed to better understand the requirements of "major" users of NCES data and information. A "major" user is defined as one who uses NCES information at least six times a year. All users interviewed for this study met this criteria. The major topics of discussion during the interviews included:

1) Currently utilized data/information formats,
2) Current mechanisms used to receive NCES data and information;
3) Mechanisms that would better serve or compliment current use of NCES data and information; and
4) Additional formats desired for the future.

7.3.1 Analysis of User Requirements

The results presented in this section represent information obtained from the 50 random selected interviews with NCES information users. Since the requirement of this study was to conduct in-depth, structured interviews with "major" users of NCES information, only users who are currently utilizing NCES data and information were selected. From analysis, it became evident that NCES is providing the statistical data base for external researchers and education groups. These researchers produce reports and studies from analyses of NCES data and information and then channel this information to selected audiences interested in education information.

From the analysis of the 50 "major" users of NCES data and information, the largest population currently being served by NCES is the Research Community and Education Associations. Within the definition of the user community, the other areas that are represented outside of the Research and Education Association groups are more indirect users of NCES data and information. These areas include Policy Makers, Educators, the Commercial Community and the General Public. NCES information is currently being channeled to these users through intermediary organizations that function in research and/or repackaging capacities. Figure 7-2 presents the portion of the user community that the information contained in this document represent.

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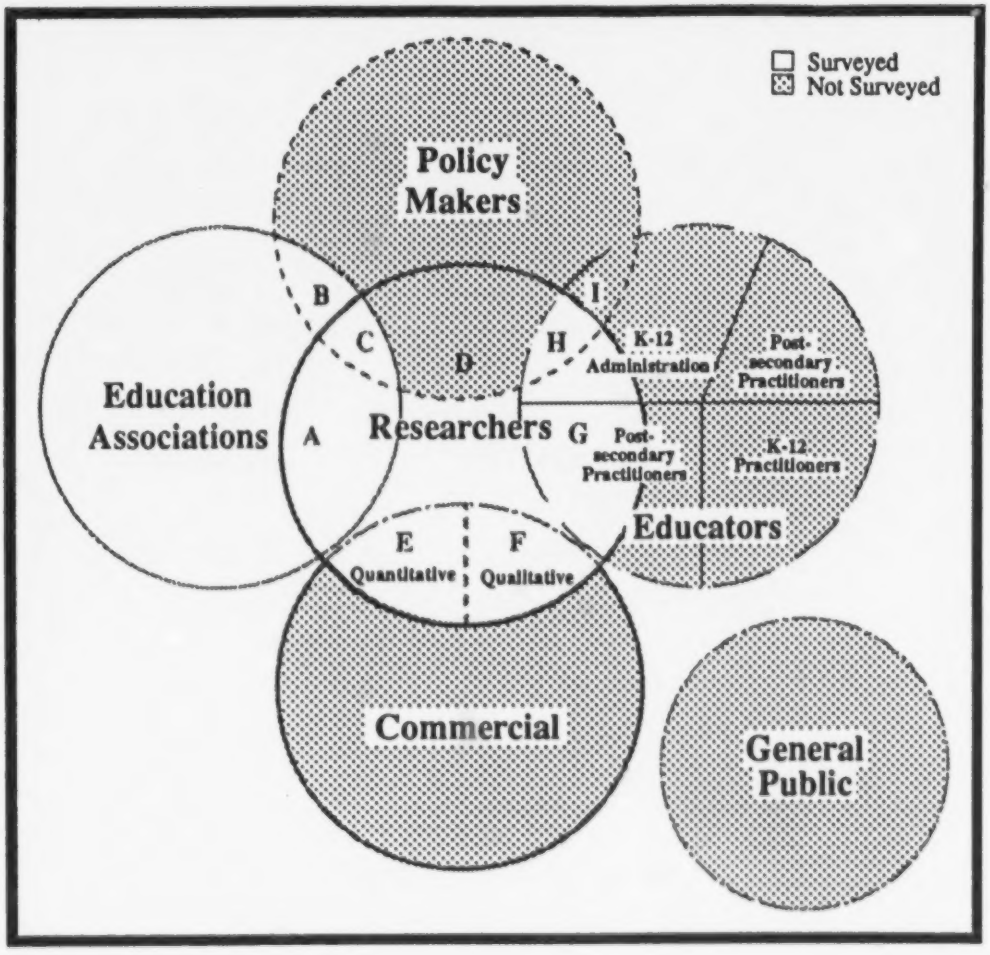
FIGURE 7-2 PORTION OF THE NCES USER COMMUNITY SAMPLED



During the course of the interview process, a list of various equipment and dissemination alternatives was presented to the user community. The list of delivery mechanisms included:

Hardware Available:	• **None available**
	• **Personal Computer**
	• **Fax Machine**
	• **Mainframe Computer**
	• **CD-ROM Reader**
	• **Telephone**
Storage Mechanisms:	• **CD-ROM**
	• **Diskettes**
	• **Magnetic Tapes**
	• **Publications**
Manipulation:	• **HyperText Databases**
Transmission:	• **NREN/InterNet**
	• **ERIC**
	• **Bulletin Boards**
	• **E-Mail**
	• **Fax**
	• **Cable**

The user population was polled as to their interest in the utilization of these technologies.

Upon completion of the user interviews, the collected information was analyzed, and individuals were categorized into the corresponding user groups based on their need attributes. From these classifications, certain preference patterns evolved. The preferences relating to the requirements of data/information formats, current methods being utilized, and future desired dissemination methods are summarized in Figure 7-3. The following sections discuss observations resulting from an analysis of the interview data.

FIGURE 7-3 SUMMARY OF NCES USER REQUIREMENTS

MOST PREFERRED DATA FORMATS AND DISSEMINATION METHODS

User Category	Data Format	Current Methods	Additional Future Methods
Education Association	Tabulated Textual	Print Phone	ERIC Bulletin Board
Education Association/ Researchers (Segment A)	Tabulated Raw	Print 9-Track Tape Diskette	CD-ROM ERIC
Education Association/ Policy Makers (Segment B)	Tabulated Visual	Diskette Print	Bulletin Board Information Network ERIC
Education Association/ Policy Makers/Researchers (Segment C)	Raw Tabulated	Print Phone Diskette	Information Network ERIC Diskette CD-ROM
Researchers	Raw Tabulated	Print 9-Track Tape	Bulletin Board ERIC Diskette
Commercial Researcher Quantitative (Segment E)	Tabulated Raw	Print Phone	On-Line CD-ROM Diskette Bulletin Board
Qualitative (Segment F)	Tabulated Visual	Phone Print	Phone Information Network
Educator Category	* sample too small to be respresentative of user group		

* Print and phone will continue to be heavily utilized across all user categories in the future.

7.3.2 Desired Data/Information Formats

Information regarding data formats currently being utilized, and their associated frequencies, was collected. It was discovered that overall, the greatest requirement is for tabular data. The order of usage with regard to data formats is as follows:

- Tabular Data - This format is the most widely utilized by the entire NCES user community. Tabular data is the most prevalent choice of data format by every user group sampled. It is the most easily understood and useful form of presentation.

- Raw Data - Due to the size of the Research Community, raw data is the second most utilized data format. The research community is interested in receiving NCES data in raw format to create information that is useful to their organization or function. These users manipulate the data according to the needs of their audience.

- Visual/Graphic Data - This data format is most widely utilized in the "repackaging" function of NCES data and information. Visual data is used for making more representative or comparative evaluations in regard to education related statistics. Often, reports and newsletter articles prepared by Education Associations contain NCES graphics, such as percentages shown in bar graphs or pie charts, to support a related educational topic.

- Textual - This is the least mentioned form of NCES data presentation currently being utilized. This format is referenced to respond to a request for a certain statistic or piece of information. Textual information is also utilized directly from a NCES document and "photo-copied" in response to a specific information request.

7.3.3 Current Physical Vehicles of Dissemination

General preferences were identified with regard to the current physical vehicles of dissemination. The following subsections describe the mechanisms that are currently being utilized across the different user categories. In general, the following vehicles are the most widely utilized:

- Printed Publications - Throughout the entire cross section of users interviewed, printed documents are the medium of choice. Publications have the marked advantage of not requiring additional knowledge or equipment to utilize them. Publications range from the large, bound documents, such as the Digest of Education Statistics, to special announcements, bulletins, and fliers released to the user community. Hard-copy products provide users the opportunity to have "hands on access" to NCES information. Print is used: (1) to do research for specific requests, (2) compliment other means of transmission, or (3) to provide a "back up" or "proof" of certain decisions or actions. Print was determined to be the easiest form in which to receive NCES data and information.

- Telephone - Personal contact with members of NCES or other knowledgeable staff within OERI plays an extremely important role in the access to NCES information by data users. The

telephone is utilized for two different functions. The Education Associations, Education Associations/Policy Maker, and the Commercial Researcher appear to use the telephone as a means to search out information (i.e., need specific statistic or answer). The Researchers/Analysts are utilizing the telephone for the purpose of gaining access to information (i.e., need to know when a certain data set will be made available).

- Diskettes/Tapes - These forms of technology are utilized primarily by those in Researcher/Analyst roles. They allow researchers to receive raw data that can be manipulated so that information can be created. These forms of storage have the capacity to be used in conjunction with in-depth statistical analysis.

7.3.4 Desired Physical Vehicles of Dissemination

It is important to acknowledge the diversity that is expressed in the user preferences for newer dissemination vehicles. A few of the users interviewed that have low technical "sophistication" and limited funds for technological advancements, are going to continue utilizing technically simple means of information retrieval, for example printed publications. These users state that this is the way they have always used NCES information and that there is no reason to change methods. However, this does not rule out the possibility that these users will eventually accept alternate means of receiving NCES information. It is human nature to want to stay with a method that one is comfortable with, but if presented with a more beneficial method there may be an inclination to change.

The majority of users interviewed are technically sophisticated. Many of these users are interested in newer, more efficient methods of receiving NCES data and information. The research community sampled has diverse technical capabilities and are currently utilizing sophisticated technologies. Comments received throughout the interview process were evaluated on an individual basis with regard to the feasibility of each alternative.

Users were asked what they will need and want in the future with regard to dissemination technologies. These user perceptions were evaluated based on whether:

1) They have access to the appropriate hardware to receive NCES data and information with regard to a certain technical alternative;
2) They have the knowledge, or technical capacity to implement a certain technical alternative; and
3) They have a desire to receive NCES data and information in the proposed alternative.

Additional desired methods of receiving NCES data and information were identified from the collection of these user preferences. In general, the user population is interested in faster access to data and

information. This is evidenced by the technologies that users identified as being attractive. The following is a general summary of additional desired transmission alternatives for NCES data and information.

- On-Line Transmission - Almost consistently across the user community, on-line transmission is favored. This includes information networks, bulletin boards and E-mail. Most users that are involved in a research/analyst capacity have access to the appropriate hardware necessary to use an on-line system. On-line transmission is desired for both downloading data sets, or gaining access to recent releases or reference material.

- CD-ROM - Most users that are utilizing the raw data format, foresee greater application of CD-ROM technology. CD-ROM technology is becoming more prevalent among the research community. Users include Education Association/Researcher, and the Quantitative Commercial user segments. Many users state that they are preparing to implement CD-ROM technology when/if there is a definite benefit to justify the purchase of a CD-ROM reader. Users stated that if CD-ROM technology will allow faster access to more information, or an easier way to perform analyses, upper management may see value in purchasing a CD-ROM reader. Several users even stated that they have recently obtained NCES data on CD-ROM and this will help provide them with the needed leverage to "push" for the appropriate CD-ROM hardware. The availability of NCES information on CD-ROM has actually helped some agencies move forward in justifying the need to acquire CD-ROM technology.

- Diskette - Those users who are interested in more visual representation of NCES data and information, which includes tabular and visual/graphic data, want to receive information on diskette. They want to receive information in an electronic format to make the process of "repackaging" information easier. For example, the National Association of College Admission Counselors (NACAC) is interested in receiving NCES information in an electronic format so that they can "cut and paste" information into their newsletters. These newsletters are passed on to approximately 5,000 institutional members.

  Those users who are working with the more statistical, raw data/tabular data formats are interested in receiving more information on diskette. Diskettes, containing smaller "sample" data sets, would provide greater access to the data and would be an easier way to manipulate specific data sets. Thus, making the information more accessible to the user community. For example, Cities in Schools (CIS) is interested in receiving random samples of large data sets on diskettes. CIS could then use the small data sets to run analyses. If the results of these "trials" appear significant, then large scale analyses of the full data set can be run on the mainframe. The availability of the small data sets alleviates the cost constraints associated with the contracting time on mainframes.

- ERIC - Education Associations and the Education Research community are extremely interested in NCES becoming more involved with the ERIC database. It seems to these users to be a "natural partnership" for NCES to include bibliographic or abstract information on the ERIC system. Many of those interviewed currently use ERIC as a first resource during the initial stages of the research process.

- Print/Telephone - These two physical vehicles of dissemination will continue to be heavily utilized in the future. They provide a certain "comfort" level and a "human" element to the reception and acceptance of NCES data and information.

- Fax - There is an interest by the education community for the use of facsimile transmission, however, there are reservations as to the compatibility of NCES data and information and the fax technology. Users are intrigued by the idea, but are concerned about how the system would be set up, what kind of information would be made available, and if the system would offer the option of speaking to a "live" NCES contact. Most users who express interest want to use the fax to receive lists of documents and new releases as opposed to actual data sets containing numbers and statistics.

7.4 Recommendations Provided by Users Interviewed

The following section discusses recommendations made by the 50 "major" users interviewed. The comments and suggestions were made consistently across all categories of users with regard to the three issues of timeliness, accessibility and content. Overall, users want to be more informed or aware of NCES product offerings.

7.4.1. Timeliness

The dissemination strategy of NCES should take into account user time requirements for obtaining the information. This demands the examination of not only the kind of data and information required, but also how quickly the data and information must be released to the end user for it to still be of value.

In general, the user community responded to the timeliness issue by stating that they wish to gain access to the information in a more "timely" fashion. On average, most users are receiving information that is approximately two to three years old. Users noted however, that this problem occurs in regard to receiving statistical data from other government agencies also.

The user population does not understand why it takes NCES several years to release the results of a survey or study. All of the users sympathize with the amount of work that goes into collecting, "cleaning" and validating the data, however they do not understand the lengthy time lag between the start of a survey and the eventual delivery of the data. Most users are interested in finding out how they can receive NCES data sooner. Therefore, many of the users are interested in receiving NCES data and

information in an electronic format prior to receiving printed documents in order to reduce the waiting period for new data.

Another time-oriented issue stated by the user population is the frequency of dispersals of NCES data and information. Users are interested in receiving more frequent, smaller releases of information. One recommendation is that NCES should release initial findings of surveys, with a disclaimer stating that the figures presented are just preliminary conclusions of the data collected. Releases of initial results of NCES studies will allow the user community to make greater use of the information. This is because users must often wait for the release date for an entire study before performing any analyses. Users state that if they were more aware of the activities of NCES, then they would be able to better incorporate NCES information into their work. Therefore, the user population is also interested in receiving monthly "up-dates" of what new studies are being conducted and information on new releases to stay better informed of what is available from NCES.

NCES currently does offer early estimates of survey findings in the form of ED-Tabs. Since users are interested in gaining earlier access to NCES information, there is a need for this service. However, it was discovered that the user population does not currently utilize these products due to the fact that they are unaware of their availability. Thus, increasing user awareness and accessibility may increase ED-TAB utilization. Users acknowledge that NCES may be performing certain useful activities (such as these Early Estimates) but they do not have time to spend researching what may be available. Users feel that NCES should go farther to ensure that the user community is informed of what is available from NCES.

7.4.2 Accessibility

In terms of physical availability, one of the main concerns is that the user audience is unaware of what information and products NCES has to offer. Additionally, even if they are aware that the information exists, they do not know how to locate it. Therefore, one of the most strongly suggested recommendations made by the user community is for NCES to provide the user community with better product catalogues describing and illustrating what is available, and how and where to obtain it.

The majority of users sampled are on one or more mailing lists at NCES. Many of them are unaware of how their name was put on the list, but are grateful to be on it. However, many feel that there is no control or management to the system. Many think that they only randomly receive certain fliers, bulletins or newsletters. Some receive multiple copies of the same publications, while some receive only sporadic

mailings. In general, the users agree on the need for some kind of mailing list maintenance in which the accuracy and distribution of documents is more closely managed. One suggestion is for NCES to distribute a check list of all upcoming releases to the user community. The current mailing list system may prove to be a valuable resource to obtain the names of NCES' current users. The user could then mark which publications are of interest and then return the completed form so the mailing lists can be updated.

Another suggestion for increasing the exposure of NCES data and information to the user community is for NCES to make greater use of the Depository Library System (DLS). NCES should be aware of the accessibility that the Depository Library System provides. There are 1,500 depository libraries that could maintain a complete reserve of all NCES documents. Libraries serve as an excellent resource to disseminate information to the interested user. Through the DLS, NCES information could be made more available to the general public.

7.4.3 Content

Many recommendations were collected with regard to the content of NCES studies and reports. The following paragraphs discuss the content related issues of:

- Relevance of Information
- Duplication of Efforts
- Social Indicators Affecting Education Information
- Complexity of Information
- Ease of Use

Users recommend that NCES evaluate the content of their offerings and the relevance of the data that they collect. This will ensure that NCES is providing useful, needed information. Users feel that all of the information that NCES provides should be serving a purpose. One user stated that "Data for data's sake is of no use. . .it must serve a purpose". Users express that NCES should have a set practice of "quality control" in which every study, program and project that is proposed is analyzed to determine the contribution that it will make to the advancement of the nation's education objectives. Users believe that NCES should be more open to suggestions from the user community as to what data and information is needed. The user community recommends that NCES implement a content evaluation process to identify (1) who will benefit from the information, and (2) how this information will be communicated to the appropriate audiences.

Another content factor that the user community is interested in is the amount of "duplication of efforts" among several of the Government agencies. Users feel that NCES should become more aware of what other Government agencies are doing in regard to data collection. Users perceive that there are studies being prepared by several Government agencies that cover the same topic areas. An example of agencies that may be putting forth similar surveys include the Bureau of the Census (BC), the Equal Opportunity Commission (EOC), and the National Science Foundation (NSF). A specific example of similar studies cited by a user is the NCES' HEGIS survey and NSF's Higher Education survey. Even though these coordinated studies do supplement one another, users perceive that there is direct overlap in the information presented in these two studies.

Information is also being collected at other Government agencies that support NCES efforts. There is a trend in the education arena toward looking into more social indicators that measure the well-being of the nation's youth. These social indicators include health, demographic and social factors that affect educational development. Users recommend that NCES work together with other federal agencies, such as the Department of Health and the Bureau of the Census, to demonstrate to the user community how the information produced by each can be used to support the other. Users would like NCES to coordinate seminars or work-shops with some of these related agencies. Collective presentation of the information will demonstrate how each agencies's data relates to and complements that of another. This will result in making all the information more useful to the user community.

In addition, many users find the information prepared by NCES "unnecessarily complex" and difficult to use. Many users feel that the information is too scientific for use by the general population. For NCES to serve a larger audience, users recommend that it broaden its product offerings to include versions that provide the information in a more useable presentation. The information should be simplified to facilitate easy reading for the less statistically sophisticated users. An example of simplified information being provided by a government agency is the Census Bureau's "We the Americans. . ." series. Users believe that there is a large potential audience for NCES information, but that the current product forms are too "heavy" to serve their needs. Since NCES serves such a diverse audience, users suggest that NCES work with its various audiences to identify desired information presentations, such as newsletters, brochures, or short reports.

Another issue that relates to the information that NCES provides is product documentation. Users recommend that NCES make its products easier to use. Many users compliment NCES for providing the table generating systems, electronic codebooks and compressed data files. Users want NCES to continue

focusing on making the information easily accessible on the different product vehicles. Users want interactive software that allows easy access and manipulation of the data. Users stress that NCES continue their efforts in the development of front-end retrieval software for selected dissemination vehicles. Diskettes and CD-ROMs are the vehicles on which the user community wants NCES to focus.

Along with product documentation, users want NCES to clearly package its information. With the actual NCES product, users want information to be provided on the following issues:

(1) What topic areas the study covers;
(2) The purpose of the study;
(3) What variables are included;
(4) How the different variables are being defined; and
(5) How to use the method to gain access to the information.

Users express interest in obtaining instructions on how to use newer information dissemination method, for example a CD-ROM. This includes the provision of "training manuals". Users are also interested in attending NCES work-shops which demonstrate how to use the different dissemination methods made available by NCES.

7.5 Overall Evaluation of NCES by User Community

The user community is genuinely satisfied with NCES and the statistics it produces. Most users state that they seldom doubt the validity or accuracy of the statistics that NCES provides. The majority of users praise NCES for the services it provides and the relationship that it has established with the education community. Many users want to offer their thanks to the NCES staff. NCES has established a good reputation and is highly respected within the education community.

The user community sampled has diverse needs and requirements for NCES data and information. However, these users share many common concerns with respect to the access and utilization of NCES products. The 50 "major" users interviewed identified opportunities of improvement for NCES dissemination of information. The NCES user community is interested in becoming more aware of what NCES has to offer and in gaining access to NCES information sooner.

SECTION 8: BASIS FOR RECOMMENDATIONS

Analysis of the information gathered during this study must be tied to a basic frame of reference or perspective. This section describes the basic assumptions on which the dissemination strategy recommendations are made.

Earlier sections of this study establish that there are a wide variety of methods which can be employed to disseminate NCES information and an even wider diversity of users. In order to develop an NCES dissemination strategy some basis or frame of reference for both the analysis of alternatives and the eventual recommendations must be employed. The recommendations should satisfy the strategic goals of NCES while meeting the functional requirements of the user population.

Strategic goals define a high level overview of desired directions that an organization should take. These goals are more global in nature and indirectly drive the dissemination strategy. Strategic goals are expressed in:

- The NCES Mission, objectives and policies,
- Other Federal regulations, rules and policies.

According to its mission statement the National Center's activities are designed to: (1) address high priority education data needs; and (2) provide consistent, reliable, complete, and accurate indicators of education status to the Department, the Congress, and other education policy makers and data users inside and outside the Government.

When the Federal Government announced its America 2000 goals, it directly impacted the mission of all agencies, associations and institutions affiliated with education, including NCES. By nature of its goals, America 2000 promotes the integration of research and practice. Three of the goals are specific to improvements in K-12 education arena, therefore the target audience is the local schools and parents. The implication for NCES is to continue and possibly expand the frequency and efficiency of its services to an increasingly broad audience.

Other legislation which greatly impacts the dissemination of education information is the legislation passed for the development of the National Research Education Network (NREN). NREN is essentially an upgrade of the existing system, Internet. Overall, the NREN legislation shows government initiative toward increasing use of high performance computing and electronic transfer of information. In line with this, NCES has internally become more interested in networking solutions. This is exemplified by upcoming projects, such as Smartline, the Institutional Communications Network and the discussion of possible connection to the Internet.

Having identified the strategic goals of NCES, it is then possible to analyze the information gathered during the execution of this study and develop a tactical approach to meeting the goals. Tactical plans are based on strategic components. They describe a specific approach to a viable solution to a particular problem. In essence, the tactical plans are the NCES dissemination recommendations. For example, a strategic goal may be to facilitate the transfer of survey data to the research community. A tactical activity that supports the strategic goal may be to establish a dedicated computer facility with communication lines that allow downloading of data to research facilities.

Having established that tactical (dissemination) recommendations must be based on the identified strategic goals of NCES, two factors are then considered with respect to the goals. These factors are:

- User Requirements
- The Course of Current and Future Technologies

User requirements drive the development of tactics to meet overall strategic objectives. This poses a challenge to NCES because of the diversity of its user audience. Users vary from having very little technical knowledge to being technologically sophisticated. In general, the major users who were surveyed have a higher than average knowledge of technology. However, there exists another large "potential user group", such as that identified by the America 2000 initiative, which may have lesser capacity in terms of technology. To best serve the requirements of all users, a mix of dissemination vehicles must be employed to serve the lowest to the highest level need.

Evolutions and revolutions in technology must also be considered when attempting to satisfy strategic goals. NCES must consistently provide and possibly fade out older technologies while at the same time actively market and inform users of the existence and use of "replacement technologies". These newer technologies can be expected to turn around at a faster pace as the average product life cycle shortens. A careful assessment of future technologies must be constantly updated to ensure that both short term and long term tactics are still viable approaches to achieving NCES data dissemination goals.

Based on the issues discussed above, the following assumptions are presented:

- NCES wishes to continue serving the communities identified in its mission statement, in addition to reaching out to a larger segment of the population, such as local educators and parents.
- A commitment to serving the diverse user community requires a broad array of dissemination capabilities.
- Selection of any technology requires careful consideration of the capabilities of the user population with respect to technical skills and budgeting issues.
- Implementation of current technologies must be considered with an eye to the future evolution of alternate technologies, and position NCES to migrate to those technologies.

Section 9 provides the recommendations resulting from an analysis of the information gathered during the execution of this project. The recommendations are based on the assumptions stated above.

SECTION 9: FINDINGS AND RECOMMENDATIONS

The following section summarizes the general findings of this study and outlines short and long term recommendations for NCES information dissemination.

9.1 Findings

9.1.1 Current Dissemination Issues

NCES generally serves its pluralistic information using community well. It offers a variety of formats and product types, and utilizes a variety of access and delivery channels. The technologies that it uses for its delivery mechanisms are largely responsive to the capabilities of its user community. Timeliness, delivery targeting and user awareness were found to be the principle weaknesses. Users want information sooner. Delivery targeting lacks priority, resources, modern methods, and NCES control. Large segments of potential users are said to be unaware of NCES products and how to acquire them.

9.1.2 Dissemination Methods of other Government Agencies

Other government agencies interviewed also provide access to their information through various dissemination methods. While traditional dissemination methods (publications and telephone) continue to be the prevailing methods of dissemination, the use of electronic transmission vehicles and CD-ROMs is increasing. The most technologically advanced agencies are providing information via commercial service bureaus and automated fax response systems. Overall, NCES is representative of other major information dissemination agencies in terms of dissemination technologies utilized.

9.1.3 Dissemination Services Offered by the Private Sector

From interviews with government contractors, it was found that the private sector is heavily marketing products and services for electronic transfer of information. Both vendors and service bureaus offer customers electronic applications such as network solutions, bulletin boards, databases, electronic mail, and fax systems.

9.1.4 Future Trends of Technology

Interviews with experts indicated future trends toward transparent network, and optical disc solutions. Projections of the future predict world interconnectivity via increasing use of wide area networks or supernetworks. Menu driven network interfaces will enable users to employ high technology solutions without the need to understand all of the inner workings of the system, hence the solutions are transparent. Likewise, increased use of optical disc technology i.e., CD-ROM, rewritable discs and multimedia solutions, will provide a more user friendly environment.

9.1.5 NCES Major Users Requirements

The diverse user population has a wide range of requirements, necessitating a "cafeteria" of NCES information dissemination methods. The majority of the users are satisfied with the quality of the statistics NCES provides. However, the major users interviewed are critical of the promotion, and accessibility of the information. Users want to be made more aware of NCES product offerings, and desire to gain access to information faster.

9.2 RECOMMENDATIONS

User Technology Associates recommends that NCES continue to expand and enhance its "cafeteria" of dissemination methods. Six recommendations for improvement are overviewed below. Supporting details are located in Appendix A of this document.

9.2.1 Automated Fax Response System

An automated fax response system is recommended for implementation within the next 12 months. NCES is advised to acquire, staff, load, operate, and promote an automated fax capability to provide worldwide 24 hour, seven day a week access. This system should supply summary information from all major surveys, with "catalogue" notes describing how to obtain related and supporting products. It should be utilized to supply survey release announcements, and other bulletins. The system easily supports the dissemination of textual, visual and tabulated information. In addition to the fax delivery feature of the system, NCES is also urged to consider the options of the system providing human contact and postal delivery of large documents. The automated fax response system benefits NCES users by providing continual, up-to-date access to information. Initial cost of the described system is approximated at $21,000. This figure includes acquisition of hardware, software, and personnel expenses.

9.2.2 Increased Use of CD-ROMs for Distribution of Information

More extensive use of CD-ROMs to distribute large raw and tabulated data sets is advised, as well as the consideration of the CD-ROM as a tool for delivering textual information. In the short term, NCES should focus on the development of front end software for CD-ROMs to increase data manipulation capabilities and ease of use by technically non-sophisticated users. Simultaneously, the promotion of CD-ROM products and presentation of user training seminars should be increased. NCES must continually monitor and evaluate the demand for CD-ROM products. As demand increases, accordingly NCES should increase production and distribution of CD-ROM products and decrease the availability of less desired products, e.g., mainframe tapes or diskettes. CD-ROMs are an advantageous dissemination vehicle because of their high storage capacity, ease of use, durability and potential future applications. Additionally, while initial cost of production is somewhat high, (fluctuating between $950 to $2400,

contingent on required specifications), unit cost per disc can be driven as low as $1.10, depending on the volume of disc produced.

9.2.3 Connection of OERI Bulletin Board to Internet

The link of OERI's bulletin board to Internet is also suggested by User Technology Associates. NCES should negotiate with OERI to connect its bulletin board with Internet. Simultaneously, NCES should appoint a coordinator to assist the OERI bulletin board system operator with regard to selecting and posting NCES information, responding to incoming inquiries, monitoring other bulletin boards, and promoting use of the bulletin board by NCES users. In the short term, summary information such as the contents of ED-TABs, bulletins, and survey release announcements should all be posted on the bulletin board. The addition of a listing of all NCES documents would also be beneficial to increasing user awareness. Long term applications for the bulletin board may include the ability to access small data files stored in repositories or to electronically order NCES documents. The justification for this recommendation is its widespread reach to university and research center audiences in relation to its minimal financial costs. If connection to Internet is made through the National Institutes of Health, the only expense is that of the program's cost recovery program. This recommendation is also consistent with the long term government initiative, NREN.

9.2.4 Referencing and Promotion of NCES Information on ERIC

Increased coordination with ERIC is also suggested to NCES. By appointing a coordinator to work with ERIC employees, NCES ensures that all of its publications are posted and updated on the bibliographic database in a meaningful way for current and potential users of NCES information. In the short term, NCES should focus on increasing user awareness that NCES documents are referenced on ERIC and encourage its use as a research tool. In the long term, NCES might explore the update and promotion of databases listings and data files currently available on ERIC. The fundamental benefit of closer alignment with ERIC is the vast university, research, business and student audiences which already are familiar with ERIC. Also, all ERIC documents are archived on microfiche. Hence, NCES should take advantage of this additional dissemination vehicle. Further, the cost in the short term is limited to personnel expenses.

9.2.5 Utilization of Diskettes for Information Distribution

NCES is urged to coordinate, standardize, and promote efforts of information dissemination via 3 1/2" and 5 1/4" low density diskettes. Based on user demand, both sizes of low density diskettes are suggested since the user community has varied equipment. More specifically, NCES users have a combination of high and low density, 3 1/2" and 5 1/4" drives. Since low density diskettes can be read by both high and low disk drives, low density diskettes of both sizes are recommended. Small data sets of tabulated, raw, textual or visual data are suitable for diskettes. Large data sets can also be disseminated on diskettes, although more than one diskette may be required. To be fully functional as a dissemination method, documentation and user training of the use of front end software and its applications are necessary. This suggestion is focused for the immediate future; it is surmised that demand for diskettes will decrease as CD-ROM products gain popularity. NCES must monitor and evaluate diskette product demand and act accordingly, i.e., as demand decreases the number of diskettes produced should be reduced. The advantage of diskette use as a dissemination mechanism is its familiarity. Most users have the equipment and knowledge to successfully use diskettes and one or more of the numerous statistical software packages available. Associated costs are also minimal, the median cost of materials and labor for diskette duplication services is $.75 per unit.

9.2.6 Improved Mailing List Management

NCES is also urged to collaborate with OERI to enhance the mailing list processes of enrollment, update, and maintenance. Appointment of an NCES coordinator is recommended to assist OERI with mailing list management. The mailing list function is critical to the information dissemination process and therefore, any enhancement to the system will benefit NCES through increased product promotion and user awareness.

Specific recommendations include:

- Increasing the priority assigned to delivery targeting in recognition of its key role in obtaining the desired return on investment in survey operations.
- Allocating additional resources to delivery targeting for the same reasons.
- Performance of a complete review of mailing list maintenance methods, including consideration of network links to associations for continuous update of membership lists, and the purchase and analytic merging of commercial mailing lists.
- Review of the organizational location of distribution functions that pertain exclusively to NCES information.

9.2.7 Conclusion

While it was found that users are satisfied for the most part, it is necessary for NCES to continually expand and advance its mix of dissemination mechanisms. The broad diversification of the user audience demands that a "cafeteria" of dissemination methods be employed by NCES. Based on user requirements collected, trends of the future of technology, and with consideration of initiatives of the Federal Government and internal policies of NCES, User Technology Associates recommend that NCES consider the following dissemination mechanisms:

- Full Implementation of an Automated Fax Response System
- Expanded Utilization of CD-ROMs
- Connection of the OERI Bulletin Board to Internet
- Referencing and Promotion on ERIC
- More Coordinated Utilization of Diskettes
- Enhancements to Mailing List Management Procedures

These recommendations may help to position NCES to better serve the needs of its user community now and in the future.

APPENDIX A

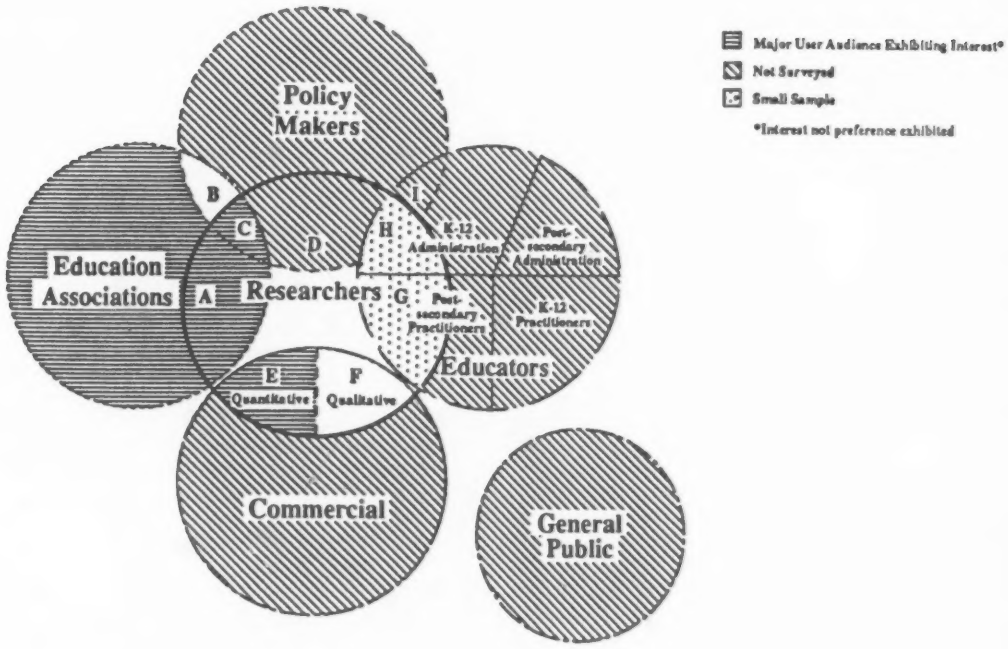
APPENDIX PREFACE

This appendix provides analysis and detail supporting the six recommendations made to NCES for enhancement of its information dissemination. As indicated by User Technology Associates' recommendations, no one dissemination alternative can be viewed as the mechanism of choice. Instead, information dissemination should be provided via a "cafeteria" or combination of mechanisms. These alternative methods should utilize technologies which cater to all audiences regardless of technical sophistication.

To support the various recommendations, the following section discusses each recommendation within the categories of:

- Descriptions & Trends of User Audiences Targeted
- Current & Future Benefits
- Implementation Procedures
- Summary of Expenses
- Cost Attachment (includes textual descriptions of associated elements and their estimated monetary costs)

Description and Trends of User Audience Exhibiting Preference
Figure A-1: User Segments Showing Interest Automated Fax System:



** The diagram reflects only a representation of the 50 major users surveyed. To obtain results indicative of the entire current and potential NCES user audience, a large scale user study must be conducted.*

Interest was expressed by users in the categories of the Commercial Sector (Segment E), Education Associations and the overlap of this category with Policy Makers (Segment B) and with Researchers (Segment C). While individuals in each of these categories had some interest in the system, none of these categories stated it as a preferred method of receiving information. It is noteworthy to mention that it is more difficult for users to evaluate a system that is not currently available. Additionally, surveying current users, solicits responses which reflect current preferences. Sampling of the potential user population, may elicit more responses of preference for "different dissemination vehicles".

The major user population surveyed is predominantly researchers. Therefore, many of these users are interested in using an automated fax response system as a mechanism for increasing their awareness of available NCES documents. Others are interested in tying the system into the mailing list or its use as an ordering system for large documents. The users recommend the system provide a current one or two page listing of all documents generated or in plan and corresponding dates of availability. The "major" user population interviewed see the fax system as a good method of information retrieval, for the "educator" user group, particularly if some information were repackaged as textual reports of specific topic areas. Essentially, different user segments would use the fax system in various ways to achieve different ends.

Current & Future Benefits

The major advantage of such a system is the tremendous accessibility to the user. Once users are aware of the system's existence, they have 24 hour access to NCES information regardless of geography, or technological sophistication. Given that the system can be updated daily, users are provided with the most current information. In the near future, facsimile machines are expected to improve transmission quality and add features of color. These technological improvements will further expand the use of the automated system to transmission of more numerical and graphical information.

Implementation Procedures

The service of an automatic fax response system can be obtained in two different ways. It can be created in-house through the purchase of software and hardware or it can be contracted through a service bureau. Analysis of both alternatives, it shows that creation of an in-house system is more cost efficient in the long run (details contained in the cost subsection).

The preliminary steps of creating this type of system in-house include a meeting of NCES employees and other designated representatives to define the body of information to reside on the system. Following successful completion of this process, the logistics of implementation include the acquisition of a 80386SX personal computer (the minimal configuration is outlined under the description of cost elements section), fax boards and voice boards, interactive software, the access of telephone lines and the time of a programmer for initial set-up.

Summary of Expenses

Initial global costs of implementing an in-house automated fax response system averages around $20,000 for the first year. This includes equipment, and personnel costs. Cost estimates for the second year are

significantly lower ($7,000 total costs) since only personnel and telephone costs are incurred. This analysis assumes that the actual cost of the fax transmission will be paid by the users of the system, not NCES.

Description of cost elements

ALTERNATIVE 1: OWN THE SYSTEM

I. Hardware

Personal Computer
The minimum configuration of the host hardware is a 80386SX personal computer with 25MHz processor and four megabyte memory. The optimal hard disk size is 80 megabytes or greater. An AT style chassis with 8 slots is also suggested.

Fax Boards/Voice Boards
To support four telephone lines, (two being fax lines and two being voice lines), two fax boards and one two-line voice board is required.

II. Interactive Software
Interactive software packages typically include multi-line support. It is easily programmable and includes six months to one year of technical support.

III. Telephone Lines
The number of telephone lines required is contingent upon the breadth of the user audience interested and the amount of traffic estimated for the system. Systems range from supporting one to 48 phone lines. To be conservative, it is best to build the system small, and add telephone lines for fax and voice boards as usage of the system increases. The costing information which follows is based on a four line system (two fax lines and two voice lines).

IV. Personnel Costs
Initially, the system could be set up by a consulting company or an in-house programmer. The coordinator of the system should be responsible for monitoring updates, managing tracking information, and promoting the system. As with other coordinator positions, this would be a small percentage of a level seven of the General Schedule.

ALTERNATIVE 2: BUY THE SERVICE

I. Service bureaus will set up individual contracts for the set-up and operation of an automated fax response system. A number of criteria determine the costs of this service. These variables include the amount of memory required for the database to be housed, the number of telephone lines required, the amount of personnel services which must be vested on the standardization of the database to the system.

ALTERNATIVE 1: OWN THE SYSTEM

	Vendor A		Vendor B	
	Year 1	Year 2	Year 1	Year 2
FIXED COSTS				
Personal Computer	$2,600.00		$2,600.00	
Software				3,000.00
Fax Boards			4,000.00	
Voice Boards			795.00	
Support Fee (1 year)			500.00	
Total Package	8,450.00		8,295.00	
Telephone Lines Installation	300.00	300.00	300.00	300.00
VARIABLE COSTS				
Telephone Costs Monthly Costs	200.00	200.00	200.00	200.00
Personnel Costs 25% of GS-7 salary ($26,286/yr)	6,571.50	6,571.50	6,571.50	6,571.50
Programmer ($15/hr) (100%/1 month)	2,640.00		2,640.00	
TOTAL COSTS	$20,761.50	$7,071.50	$20,606.50	$7,071.50

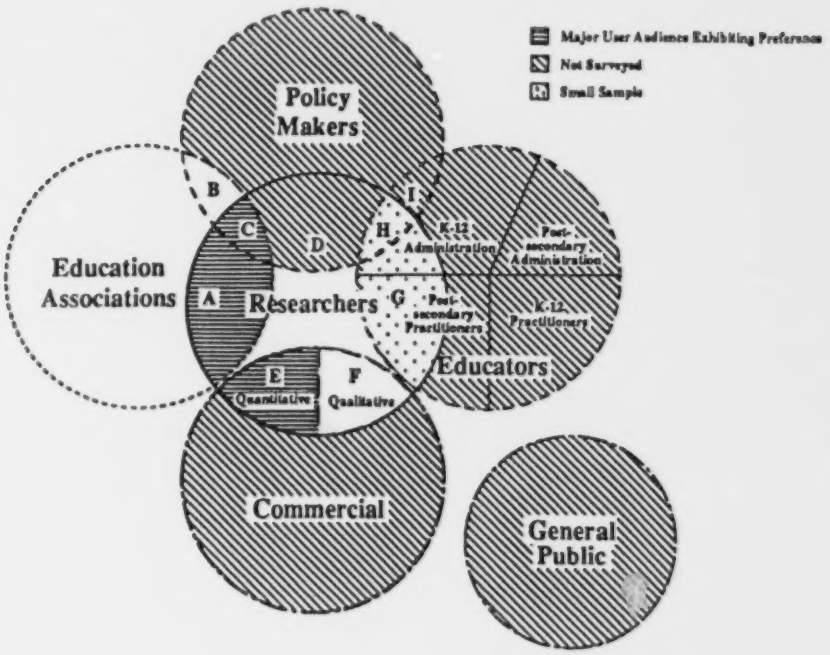
ALTERNATIVE 2: BUY THE SERVICE

	Year 1	Year 2
VARIABLE COSTS		
*Set-up Fee for Year 1	16,000.00	
Fees for Subsequent Years		3,200.00
NCES Personnel Costs	6,571.50	6,571.50
TOTAL VARIABLE COSTS	$22,571.50	$9,771.50

*Estimate based on the following criteria:

- Four telephone lines.
- Up to 1000 pages of information contained in the database.
- Average document length is two pages.
- Seventy percent of the information is textual, thirty percent of the information is in the forms of charts and graphs. If the percentage of graphs increase, additional costs will be accrued because of increased storage required.
- Database will be updated on a quarterly basis.
- No personnel services of the vendor are included in the price estimate. In lieu of this expense, a personnel expense within NCES is estimated into the system cost.

Description and Trends of User Audience Exhibiting Preference
Figure A-2: User Segments Preferring CD-ROMs



** The diagram reflects only a representation of the 50 major users surveyed. To obtain results indicative of the entire current and potential NCES user audience, a large scale user study must be conducted.*

Twenty-two of the 50 major users interviewed, are interested in continued or future use of CD-ROMs containing NCES information. The shaded areas of Figure A-1 indicate the user segments most preferring CD-ROMs. Overall, those most interested in CD-ROMs were located primarily in the research segment of the Education Associations (segment A), the Policy Makers (segment C), and the Quantitative sector of the Commercial Community (segment E). The non-research, policy making section of the Education Associations (segment B) did not show preference for CD-ROMs, however some interest is present. Analysis shows that the interests of this segment were evenly split between CD-ROMs and diskettes. This distribution of interest is noteworthy since it may be a reflection of the transition from an established technology (diskettes) to a more current technology (CD-ROMs).

Many of the users expressing preference for CD-ROMs (segments A, C, E) are using raw data to generate information. These users had previously relied on mainframe tapes or diskette sets for data exchange and manipulation. The CD-ROM is seen as an improvement over both methods in terms of time and cost efficiency. The diskette sets of large data sets were criticized as being cumbersome since use required the diskettes to be switched back and forth until the appropriate combinations of data sets were found. The CD-ROM, on the other hand, allows access to all of the data at once. The CD-ROM is preferred over mainframe tapes since on-line connect charges can be eliminated but large amounts of data can still be accessed and manipulated.

Current and Future Benefits

In addition to the technical benefits the users pinpointed, CD-ROM technology offers many other superior features. Included are exceptional durability, value-added features and future applications. Fingerprints, scratches, and dust which can destroy information placed on a diskette are less likely to affect a CD-ROM. It is believed that libraries of the future will store publications in CD-ROM format because of its exceptional durability. Value-added features of CD-ROMs include its capacity to store sound, images and other multimedia data. Other future enhancements provide variations of CD-ROM use. For example, increased use of jukeboxes or "network-like applications". Jukeboxes allow multiple users to share sets of CD-ROMs.

Another positive futuristic point of CD-ROM technology is its value in world interconnectivity schemes. CD-ROMs are often used internationally, especially by those countries lacking good telecommunications. The importance of international consistency of dissemination vehicles may increase as educational objectives become more globally focused. For example, one of the goals of America 2000, is to encourage American students to strive to be in the top of the mathematics and science "classes" of the world. The evaluation process of such a goal may promote more exchange of education statistics and information on an international level.

As optical technology continues to progress, discs will begin to have capacity to be rewritten. Even though commercial vendors, in the future may leave CD-ROM and move to the next technology, CD-ROMs will remain the medium of choice in some areas, such as libraries, and archival organizations. The CD-ROM is a logical choice for an organization like NCES which produces information which it does not want overwritten. Gaining experience in the industry now, benefits NCES in the long run; it will be able to grow and expand with the industry rather than "playing catch up".

Implementation Procedures

To produce a CD-ROM, a commercial or government manufacturer must be contracted. The responsibilities of the data provider begin with a series of decisions pertaining to specifications of the CD-ROM. CD-ROMs can be created to image the database with specifications for either Macintosh and/or IBM based systems.

CD-ROM manufacturers can also include front end software to furnish interactive or basic search functions. The inclusion of a "search engine" is typical because it increases user friendliness and increases control and capabilities provided to the user. CD-ROM manufacturers offer services to develop front end applications at additional costs. These vendors frequently specialize in text, not statistical search functions. To obtain the most efficient, least costly front end search software, it is often better to develop the applications in advance of approaching a CD-ROM manufacturer.

Once these specifications have been established, the manufacturing process can begin. The data provider begins the process by delivering the data or information to the manufacturer in a database via a 9-track tape or and eight millimeter high density diskettes. From this point, the manufacturer is responsible for the creation of the master and replicated discs within a designated production schedule (the average cycle is 5 days).

Summary of Expenses

The multi-step manufacturing process and associated costs are detailed on the following pages. In general, initial manufacturing cost include set-up procedures called pre-mastering and production of a master disc or stamp used for replication purposes. Pre-mastering can be formatted for either ISO 9660 High Sierra or Apple HFS or a combination thereof (i.e., a hybrid image build). The associated pre-mastering fees vary depending on whether the pre-mastering process is an image or hybrid image build.

Price ranges for a single image build pre-mastering and mastering process fluctuate from $950 to $1800. Alternatively hybrid pre-mastering and mastering processes escalate the cost range to approximately $1450 to $2400. The high initial costs of production reflect the machine intensiveness of the process. Alternatively, the production of replicate discs is less intensive as reflected in the low per disc costs which fluctuate around a median of $1.80. This pricing range can be furthered reduced through alternative packaging and production of larger quantities. The unit cost per disc can be reduced as low as $1.10 per disc. Further detail is found in the following.

Description of cost elements

I. PRE-MASTERING

Pre-mastering is the process of organizing the data through a software program which encodes it to meet the established ISO 9660 standards. Both ISO 9660, High Sierra or Apple HFS formatting or a combination of both is available. Pre-mastering which requires a hybrid or combination of both the High Sierra and Apple HFS format is twice the cost of formatting for one or the other.

The actual pre-mastering can be completed by the data providing agency or the vendor producing the CD-ROM. It is most often done by the vendor since certain hardware and software requirements are inherent to the process.

II. MASTERING

The mastering process is a machine intensive process. A piece of optical grade glass is coated with a layer of sensitive material. The information from the pre-mastered database is then etched into the glass via a high power laser to create the initial glass master disc. The mastering system then checks the disc for adherence to Red Book specifications. If the glass reproduction passes the system testing, another master disc is made out of metal, typically nickel, through a process called electroforming. This stamp is used to produce multiple replications, which is a quick, inexpensive process.

III. PACKAGING COSTS

Other costs and issues associated with CD-ROM production include packaging, postal costs and the factor of production time. Most often, CD-ROMs are packaged in "jewel boxes" or plastic carrying cases with liners. The costs of the jewel boxes are typically included in the fee for replications but the inserts are done for an additional price. Usually, the more additional features wanted, for example multiple colors on the CD-ROM or multiple inserts, the higher the associated costs. Some contractors reduce overall production costs by offering cardboard packaging as an alternative to the jewel boxes. This type of packaging eliminates the need for inserts and reduces postal costs.

IV. PRODUCTION TIME

Turn-around time for CD-ROMs can vary anywhere from same day delivery to a ten day interim. Five days is the average turn-around time of a CD-ROM product. Delivery in less than five days is considered rapid and therefore has a higher associated cost. And production times allowing from five to over ten days have associated price discounts from five to fifteen percent.

*** It is assumed that front end retrieval software to be used has or will be developed internally to NCES or through the efforts of an independent contractor other than the manufacturer.

Fixed costs of a basic unit and associated price quotes are outlined initially. The basic unit includes production of the master disc and replicates with a two color label and packaged in a jewel box. Variable or special request costs are then viewed with their associated price estimates. Variable costs typically include add-on packaging features.

***FIXED COSTS, BASIC UNIT:

	Vendor A	Vendor B
PRE-MASTERING/IMAGE BUILD	400.00	None
PRE-MASTERING/HYBRID BUILD	1000.00	VARIABLE
MASTERING	1400.00	950.00
REPLICATIONS/DISC	1.80	1.75
ESTIMATE PRODUCTION TIME	5 Days	5 Days
TOTAL FIXED COSTS/IMAGE BUILD		
Total Production Costs:	1800.00	950.00
Per Disc Cost:	1.80	1.75
TOTAL FIXED COSTS/HYBRID BUILD		
Total Production Costs:	2400.00	1450.00 (estimate only)
Per Disc Cost:	1.80	1.75

VARIABLE COSTS:

PROTOTYPING (upon request)	480.00
Associated Credit on Mastering Fee	250.00
PACKAGING TYPES:	Jewel boxes
	Cardboard Sleeves

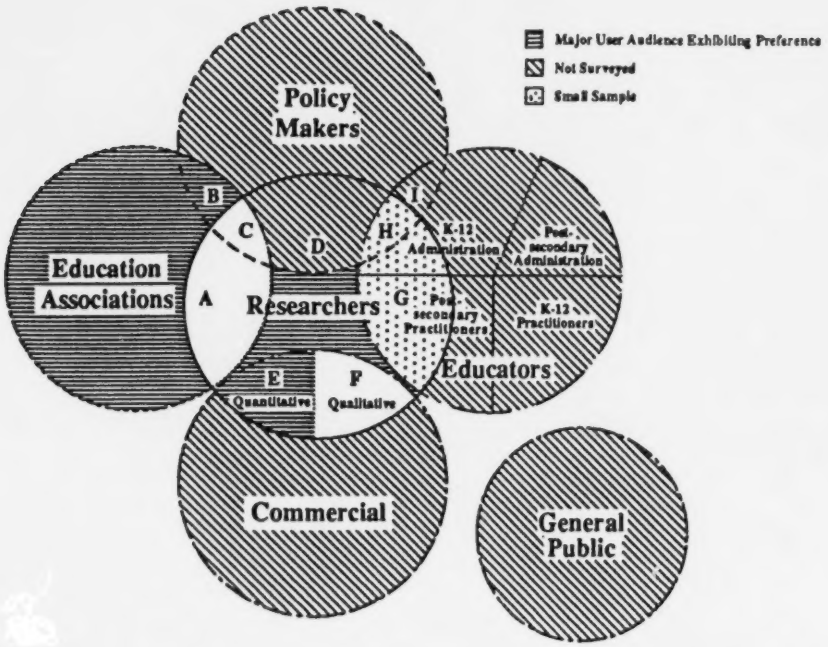
* price of unit included in replication cost a variance of mailing costs and other variables of packaging are contingent on the type chosen. For example, liners are associated with jewel box packaging, whereas printing charges are associated with cardboard sleeves.

Additional Packaging Costs Per Disc	
Insertion of folders, booklets, or liners	.05
Shrink wrapping	.05
Other packaging options variable	

TYPICAL PRODUCTION TIME DISCOUNTS

Discounts of 5% to 15% can be obtained by lengthening production time from five to six to ten days respectively.

Description and Trends of User Audience Exhibiting Preference
Figure A-3: User Segments Preferring Electronic Bulletin Boards:



** The diagram reflects only a representation of the 50 major users surveyed. To obtain results indicative of the entire current and potential NCES user audience, a large scale user study must be conducted.*

Eighteen of the 50 major users surveyed, responded favorably to the idea of obtaining information from either a networked or a stand alone electronic bulletin board system. The majority of those interested fell in the user categories of Policy Maker, Commercial, and Researcher.

While each of these groups and some subcategories are interested in use of the bulletin board, the information each group desires differs. The commercial segment wants to use the bulletin board for as

a means of product awareness and delivery. They would like to extract listings of all NCES documents, and to electronically order documents. The other segments mentioned the same options but are also interested in more information retrieval functions. For example, the users desire the ability to receive NCES information (e.g., ED-TABs) on-line and route questions via electronic mail.

Again, user awareness is a problem. Many of the users interviewed were not aware that NCES information resides on OERI's bulletin board or that the same information is also posted to other bulletin boards. Of those users who were aware of the bulletin board service, many had tried to use the it and had serious reservations about its efficiency. The users view the bulletin board as inaccessible after repeatedly receiving busy signals when trying to call it. Some determined users eventually accessed it, only to discover they did not understand how to use it. Overall, the bulletin board is a desired information dissemination mechanism but it requires enhancement.

Current and Future Benefits

As one expert stated "a good deal can be done with a bulletin board but organizations typically don't spend enough time understanding users requirements of bulletin boards". Given adequate accessibility, the bulletin board option gives vast numbers of users access to information electronically at any time of the day or night. Since, it can be updated daily, bulletin boards typically provide the most current information. Forecasts of the future indicate that the average users of computers will become more and more sophisticated, and in turn will increasingly utilize on-line services to find and receive information. Bulletin boards, conferences and forums will become increasingly important.

Implementation Procedures

For NCES to consider the current bulletin board system as a viable mode of information transfer, then administrative, promotional and technical changes must occur. First and foremost, coordination of the collection and dissemination of information for the bulletin board must increase. OERI and NCES should jointly establish documentation and guidelines for this administrative process. Secondly, it must be promoted to increase the amount and frequency of its use. And finally, to permit higher traffic through the system, the current bulletin board should be changed in one of two ways. It can either be upgraded or there should be an increased coordination between NCES and OERI and the bulletin board should be connected to Internet (specifics discussed in the following section).

Administrative Changes

For NCES to view OERI's bulletin board as a viable mechanism for disseminating their information, a number of processes improving coordination may be implemented. First, both technical and non-technical documentation describing how to format information for inclusion on the bulletin board system should be written and explained to all NCES employees.

Additionally, an NCES employee should be appointed to collect, filter and deliver all appropriate NCES information to the bulletin board system operator electronically or on diskette. This organization of efforts will eliminate some of the duplicity of tasks, i.e., eliminate the need for the system operator to re-key printed information. In addition, it eliminates diffusion of responsibility to increase the overall coordination of the dissemination strategy.

Increased Promotion

Promotion responsibilities should also be assigned to an appointed NCES coordinator. For example, the coordinator's responsibilities may include answering any incoming questions for NCES which the OERI bulletin board receives, or monitoring listserves (another form of bulletin boards with specialized topics and conferencing). These monitoring processes both serve to promote NCES as an agency by providing information and increase name recognition to those currently unfamiliar with NCES. The same individual coordinating efforts with ERIC, could be assigned to this task as well.

Technical/Process Upgrades

The bulletin board can be changed to serve a larger audience in two ways. Upgrades of the various components (host hardware, software and number of telephone lines) or the bulletin board can be networked more extensively. On the following pages, a detailed description of the specifics of the upgrades of the various components are outlined with their associated costs. However, User Technology Associates recommends that the alternate choice of connecting the bulletin board to Internet, is more effective and cost efficient. Further details of this option are described in the networking section.

Descriptions of cost elements

UPGRADE OERI'S CURRENT CENTRALIZED BULLETIN BOARD

I. HARDWARE REQUIREMENTS
If new host equipment is in the plan, it is suggested that a 386 based system with four megabytes of RAM, and an 80 megabyte hard drive.

II. SOFTWARE REQUIREMENTS
It is suggested that the bulletin board software is upgraded from the RBBS software to a package which has more features, is more user friendly, and provides more information for database management, for example, PCBoard.

III. MODEM REQUIREMENTS
For acceptable speed of transmission a minimum of a 9600 baud modem is suggested.

IV. TELEPHONE LINE REQUIREMENTS
If a centralized (non-networked) bulletin board is chosen, the installation of an additional 11 telephone lines is suggested to handle the increasing traffic on the system. These lines should be toll free numbers to encourage use of the bulletin board system.

TOTAL SYSTEM UPGRADE
FIXED COSTS

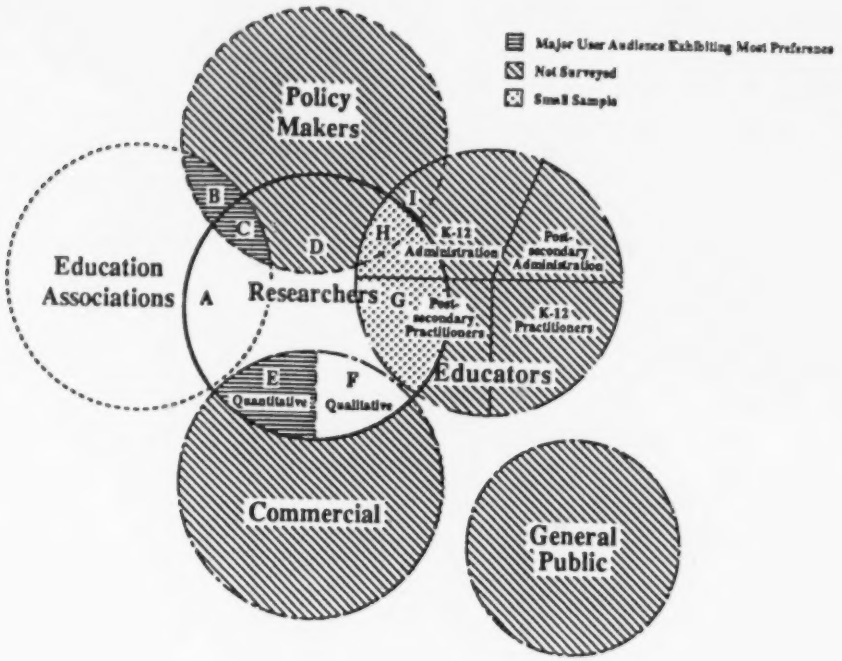
Hardware with 9600 baud internal modem	2,000.00
Software Upgrade	500.00
Toll free number installations of local lines (11)	478.72
Local telephone line installations (11)	300.00

VARIABLE COSTS

800 number monthly service fees (Average rate of $14.99 per hour per user	VARIABLE
NCES Coordinator Salary	6,571.50
TOTAL COSTS	*9,850.22

* Usage rates of $14.99 per hour/per user must be added to the cost

Description and Trends of User Audience Exhibiting Preference
Figure A-4: User Segments Preferring Networks:



** The diagram reflects only a representation of the 50 major users surveyed. To obtain results indicative of the entire current and potential NCES user audience, a large scale user study must be conducted.*

As with the bulletin board option, eighteen of the 50 major users surveyed had a current or future interest in connecting to information network(s) to gain access to databases and bulletin boards. The user categories (segment B and C) indicating a preference for information networks as a vehicle of dissemination represent 8 of the 18 major users having an interest. This may be viewed as a reflection of the number of major users with networking ideas in their plans versus the number currently using them.

The "major" users were interviewed about their networking activities at a general level. Overall, the major users interviewed were using either on-line service bureaus (e.g., Compuserv/Dialog), commercial telecommunication networks (e.g., GTEnet), or government funded/university funded networks (Internet, Bitnet, National Diffusion Network). Many of those using or planning to use the Internet expressed interest in the concept of the National Research and Education Network (NREN) (9 out of 50). Some of the individuals were unclear or unsure of the NREN concept but commented if the Internet upgrade is supported, NCES should be involved.

Technical and Future Benefits

In general, technological trends indicate an increase of network usage. Three types of telecommunication networks should be considered to support NCES bulletin boards and information, government funded, commercial, and public domain networks.

NCES currently makes its information available on commercial telecommunications networks, such as the Institutional Communications Network on GTEnet and bulletin boards carried on Dialcom. It also utilizes a government funded network, the National Diffusion Network. However, NCES is currently not utilizing public domain networks such as RelayNet International Message Exchange (RIME) to distribute information.

Public domain networks are not for profit endeavors, consisting of a series of independently run bulletin boards. These bulletin boards operate through companies as a means for product support or by individuals interested in technology and information transfer. Most data providers charge annual subscriptions, averaging around $25/year to support their service.

Government initiatives support the increased utilization of moving information via networks. Connection to the Internet and to public domain networks may serve to increase accessibility to NCES users. Many of NCES major users, organizations within the Department of Education and future government plans support the Internet and the plans for its upgrade, i.e., NREN.

The evidence of the user interviews, and current government initiatives indicates support for NCES becoming a node on Internet. Internet offers NCES a viable option to reach mainframe users and

personal computer users both now and in the future. Becoming a node on Internet also permits access to public domain networks, such as RIME and other government funded networks such as Bitnet. This would automatically service hundreds of thousands of Internet users in universities, and education and government agencies. In addition it would reach a potential user audience through the public domain networks which NCES does not currently utilize. At a minimum, the use of these public domain networks will be a potential to market NCES's name more extensively and reach a new "potential user" audience. Additionally, networking the bulletin board to Internet eliminates the need and cost of upgrading the hardware and increasing the number of phone lines.

Implementation Procedures

Any changes to the bulletin board system, including increased posting of NCES information, must be cleared through the Education Information Resources Division of OERI which currently runs the bulletin board system. It is suggested that a joint meeting is held to discuss the proposed administrative, marketing and networking issues.

Assuming a consensus can be reached determining that the bulletin board should be connected to Internet, two options for implementation are present. The first option is to purchase a site license for NCES. The second option is to sublet time from a site already licensed for Internet, such as the National Institutes of Health. The latter option is the most cost efficient and the least time consuming procedure for access to the Internet. To establish this relationship with the National Institutes of Health, it is necessary to contact their Project Control Office. This office has standard procedures for linking other sites into their system.

Summary of Expenses

While the associated cost of purchasing a site license on Internet is relatively expensive (approximately $18,000), the total cost of establishing a relationship with the National Institutes of Health is minimal. The National Institutes of Health offers connection hardware (modem) and software (Kermit) free of charge, as well as offering free training classes and documentation. The only financial charge is the actual connect time of the users which is typically less than $1.00 per hour for each user regardless of the his or her geographic location. This compares very favorably to the option of implementing toll free telephone numbers to the centralized bulletin board which average a cost of $14.99 per hour per user.

The NIH has set up this type of "billing" system as a cost recovery plan, therefore internal billing to NCES will reflect only actual on-line charges accrued. Since an NCES employee in the role of coordinator is still necessary a percentage of a grade 7, step 7 salary should still be factored into final cost estimates.

Description of cost elements

I. SET-UP FEES
Connection with Internet can be made in more than one way, either a site license can be purchased or connection can be made through an existing Internet node such as he National Institutes of Health. The National Institutes of Health currently support 18,000 Internet users and access over 2000 different lines.

II. TRAINING/DOCUMENTATION
The NCES coordinator and the OERI system operator will require training on the software (Kermit). The National Institutes of Health provides both the software and training on its use and general information of how to use Internet. Additional documentation required (reference material) is also provided by the National Institutes of Health.

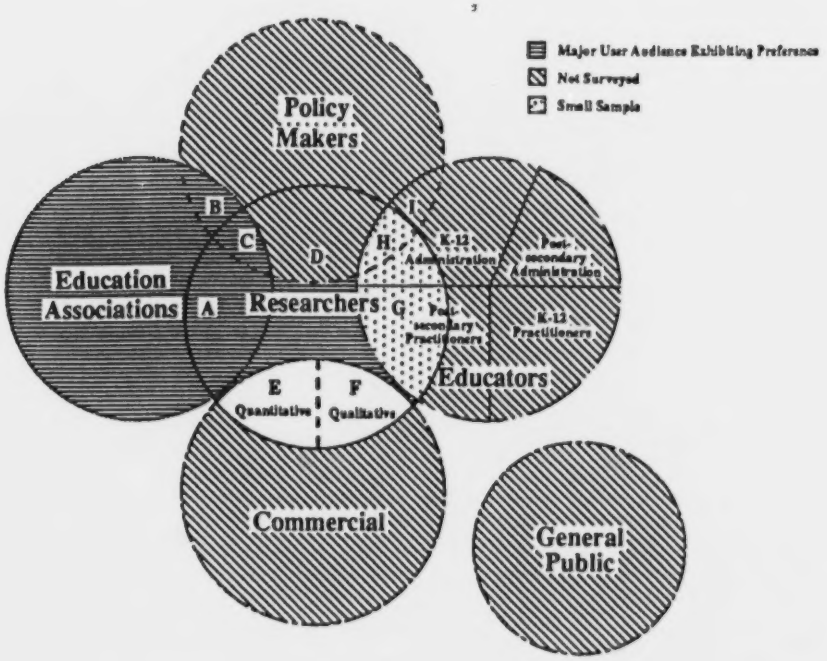
III. NCES COORDINATOR
An NCES coordinator is necessary to assist the OERI system operator in the collection, posting and distribution of NCES information.

FIXED COSTS	
*Software	0.00
*Hardware (modem)	0.00
*Training	0.00
*Documentation	0.00

VARIABLE COSTS	
Usage Fees ($1.00 per hour per user)	VARIABLE
NCES Coordinator Salary	$6,571.50
TOTAL COSTS	**$6571.50

* The National Institutes of Health provide these components free of charge.
** Usage rates of $1.00 per hour per user must be added to total costs

Description and Trends of User Audience Exhibiting Preference
Figure A-5: User Segments Preferring ERIC:



** The diagram reflects only a representation of the 50 major users surveyed. To obtain results indicative of the entire current and potential NCES user audience, a large scale user study must be conducted.*

ERIC is most preferred by those major users falling in the Researchers, Education Associations and the research (segment A) and policy-making (segment B and C) subsegments thereof. Twenty-one of the 50 major users interviewed are interested in the option of using ERIC's bibliographic database as an initial step to find NCES documents. In particular, education associations expressed great interest in the ERIC. Even those not having access to equipment had contacts to carry out ERIC searches for them. Commercial researchers had access to ERIC through service bureaus such as Dialog and Compuserv. However, this segment did not appear to use ERIC as extensively as the other user groupings.

Most users interviewed were unaware that NCES documents were listed on ERIC; none had knowledge of the data files available. Of those users aware that NCES had bibliographic listings on ERIC, many had experienced problems in finding them. One possible explanation may be that NCES documents are listed under various identifiers, such as NCES, National Center for Education Statistics, National Center for Educational Statistics, and the Center for Education Statistics. These headings all contain documents which are mutually exclusive to its identifier, therefore confusing users of the system. Users viewed ERIC as a practical product promotion option for NCES, if the aforementioned difficulties are rectified.

Current and Future Benefits

ERIC has been building its customer base since its creation over 20 years ago. Closer coordination with ERIC would give NCES access to the hundreds of thousands of on-line users currently using ERIC. Additionally, NCES would be able to piggyback on ERIC's plans to expand its marketing base. In line with the goals of America 2000, ERIC will be encouraging public schools, private schools, and business supported academies to use its database. This bridging of the gap between research and practice by ERIC would likewise assist NCES in getting their information to the local schools. Currently, "repackagers" of NCES information serve this audience but closer coordination with ERIC would allow NCES to complement that work first hand.

NCES would also gain knowledge from ERIC as it moves into new technological areas. Currently, ERIC is distributing information on CD-ROM as well as considering what its new role will be in distributing this and other non-print materials.

Implementation Procedures

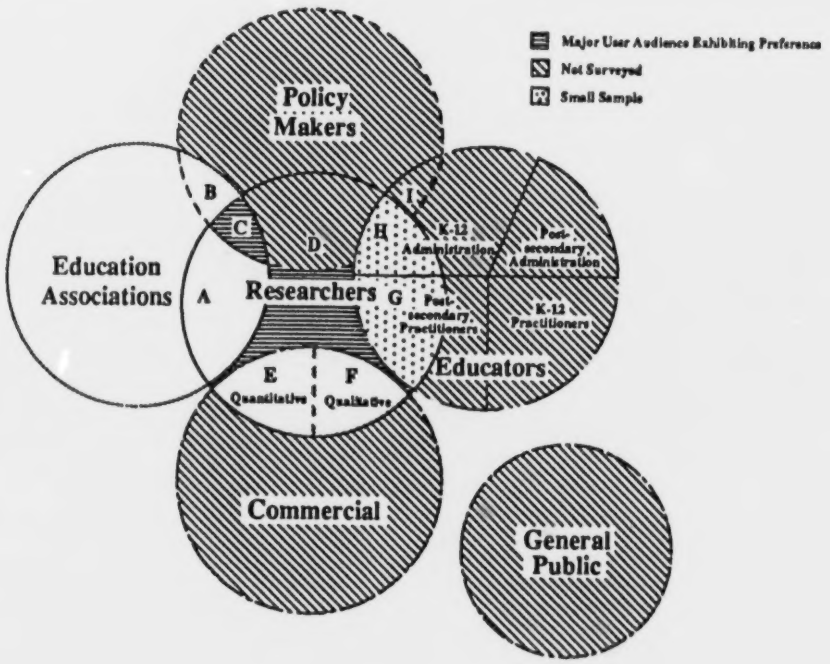
Closer coordination with ERIC is suggested. NCES should assign an employee to work on a part-time basis functioning in a liaison role with ERIC. The responsibilities of this position are foreseen as including administrative and promotional and other types of functions. Administrative responsibilities are focused on providing assistance in the distribution of NCES publications to ERIC, and relaying back to NCES any knowledge discovered as ERIC moves toward new technologies. Therefore, the coordinator should also attend ERIC meetings and conferences to contribute NCES viewpoints to ERIC.

Promotional duties are the identification and negotiation of NCES product promotion techniques with ERIC, and increasing NCES user awareness of any changes made to the ERIC database. For example, if more data files are added, it would be the coordinator's responsibility to promote the use of these files. Other areas of responsibility may include exploring new information transfer options, such as placing more NCES data files on ERIC.

Summary of Expenses

In addition to all of the advantages mentioned, this recommendation is also very cost efficient. The only financial cost associated with this recommendation is approximately 25 percent of the salary of a grade level 7, step level 7 NCES employee estimated at $6571.50 per annum.

Description and Trends of User Audience Exhibiting Preference
Figure A-6: User Segments Preferring Diskettes:



** The diagram reflects only a representation of the 50 major users surveyed. To obtain results indicative of the entire current and potential NCES user audience, a large scale user study must be conducted.*

Sixteen of the 50 major users surveyed, mentioned diskettes as a preferred method of receiving NCES information. These users are primarily located in the "independent" researchers segment which includes independent consultants, graduate students and employees of "think tank" organizations.

This grouping uses diskettes mostly as a medium of manipulating tabulated data. The majority of these users, are either supplying their own equipment or use organization supplied equipment which is not state

of the art. Most of these individuals state they prefer diskettes because a CD-ROM reader is not accessible to them. Some of the other users preferring diskettes are simply resistant to change.

Current and Future Benefits

While diskettes are not a new technology, their use and flexibility is indisputable. The overwhelming advantage of this medium is its well established reputation and use, most NCES users have the equipment and knowledge to successfully utilize it. Likewise, software applications to generate tables and encourage manipulation of data are already available both commercially and through efforts at NCES.

The question to be addressed references the type of diskette to be used. The two issues of concern are (1) whether to use low or high density diskettes, and (2) whether to choose 3 1/2" microdiskettes or 5 1/4" floppies. Current trends favor high density microdiskettes because they hold more information than their low density counterparts. However, users with low density drives would be unable read high density diskettes. Current trends show 3 1/2" diskettes are slowly replacing 5 1/4" diskettes because of their superior durability and increased capacity. However, users will continue to own both types of drives. Therefore, overall it is recommended that both the 3 1/2" and the 5 1/4" low density diskettes should be made available.

Implementation Procedures

Transfer of information to diskette format for mass distribution is an easy, inexpensive process. NCES and OERI should coordinate efforts to select information and prepare a master diskettes containing small data sets. These masters can then be sent to a duplication service. The responsibilities of NCES would include production of master 5 1/4" and 3 1/2" diskette(s) using personal computers or a 9-track tape master using a mainframe. Specific quality control techniques for master diskette creation are outlined

by the vendors specializing in microdiskette duplication. Once created the master copy(ies) are duplicated by the service bureau, some of which also offer distribution services.

Summary of Expenses

The average cost of the duplication process includes the purchase of the diskettes, protective sleeves, and a service fee. Low density diskettes are less expensive than their high density counterparts. Costs of 3 1/2" low density diskette range from $0.65 to $1.04 per unit. The expense of 5 1/4" low density diskette is slightly lower, prices range from $0.50 to $0.81 per unit. Usually an additional fee is added for the provision and printing of labels. This fee varies from $0.03 to $0.08 per unit.

Descriptions of cost elements

I. Preparation Process
To produce high quality duplicates of diskettes, a good master diskette set is required. Most duplication vendors outline a series of simple steps for the creation of the master diskettes. This is done as a troubleshooting measure to decrease the margin for error.

II. Duplication Process
Vendors offering diskette duplication services typically include the material costs of the diskette, the protective sleeve, and the service charge of the duplication into one overall price. The expense varies on the type of diskette used (i.e., low or high density, and size 3 1/2" or 5 1/4").

III. Additional Fees
Extra fees are charges for providing, printing and affixing labels to the diskettes. Often, the duplication vendor will offer the customer a choice of supplying their own labels for the diskettes or buying them the shop. If the customer chooses to supply their own labels, the print/labeling charge is discounted accordingly.

Duplication fees listed include the cost of the diskettes, the protective sleeves, and service fee for the duplication process.

Packaging/mailing costs are not inclusive in the price estimates given.

MATERIAL & DUPLICATION COSTS	Vendor A	Vendor B	
	Median Price Estimates Flat Rate	Over Govt. 1500 Discount < 1500	
FIXED PER DISKETTE COSTS			
* 3 1/2" LOW DENSITY DISKETTE	0.65	0.95	1.04
* 5 1/4" LOW DENSITY DISKETTE	0.50	0.65	0.81
* 3 1/2" HIGH DENSITY DISKETTE	1.10	1.45	1.44
* 5 1/4" HIGH DENSITY DISKETTE	0.80	1.00	1.13
VARIABLE COSTS			
LABELING CHARGES/diskette			
Provide, Print & Affix Label	0.08	0.08	0.08
Print & Affix Labels	0.03	0.03	0.03

* Government discount prices are a 10% reduction of the highest quote price. The discount is subtracted from any quantity under 1500 which is duplicated. Further reductions are standard for quantities over 1500.

MAILING LIST MANAGEMENT ENHANCEMENTS

Description and Trends of User Audience Exhibiting Preference

The majority of the 50 major NCES users interviewed, identified the management of the mailing list as a potential area of improvement for NCES. Users state that the current system is not operating as efficiently as it could. From the users perspective, there seems to be a lack of internal coordination. For example, many users indicated that they receive duplicate or sporadic mailings of NCES publications such as, bulletins, ED-TABS, and news releases.

Current & Future Benefits

Both current and future distribution of NCES documents to its users is dependent on the efficiency of the mailing list process. Therefore, enhancements to the management of this procedure is crucial for all manually distributed publications. All interested parties, whether current or "potential" users, should be knowledgeable of how information can be ordered via the mailing list system. It is recommended that NCES support OERI in developing and implementing a more efficient mailing list distribution system. The new system and procedures should focus on solving any mailing list inconsistencies the current system is perpetuating.

Implementation Procedures

It is recognized that NCES does not have full control of the mailing list processes of development and maintenance. Therefore, it is suggested that NCES coordinate more closely with the departments/vendors responsible for these activities. A NCES employee(s) must be established as a point of contact or "coordinator" for the mailing list function. The focus of this role is to improve processes or technologies employed. While more research is required before specific recommendations can be made, areas of consideration should include:

- Incorporation of bar codes into the system or other new applications technology.
- Research of systems and procedures being applied in organizations similar to NCES.
- Exploration of possible system upgrades in terms of hardware and software to provide a "better and faster" way of maintaining the lists.

Many Government agencies and commercial companies manage effective and efficient mailing list systems. A sampling of these existing applications will assist NCES in the identification of updated mailing list procedures. This research methodology which extracts beneficial features of existing practices, would reduce the front end cost to NCES and ensure a successful implementation.

It is necessary to further study the current mailing list procedures, and technologies used to provide further detailed recommendations and associated costs.

OTHER CONSIDERATIONS

Printed Publications

Overwhelmingly, 100% of the user surveyed include printed publications in their list of current mechanisms of obtaining NCES information. Likewise, the users see continued use of this medium. As more information becomes available through electronic transmission and other technological media, the users view printed publications in a different role. Whereas, the printed publication is now a primary means of receiving information, in the future it will be a complementary information source. For example, one researcher wants tabulated data available on CD-ROM, but would also like to have a printed version of the same information for quick manual reference. Therefore, although there will be an overall increase in the amount of information stored and delivered electronically, the printed document will also have a place in the distribution system.

Telephone

As with printed publications, the traditional dissemination mechanism of personal telephone contacts will still have a place in dissemination programs of the future. Many of the users want to be able to structure their searches with the advice of knowledgeable NCES employees. Many users have established personal contacts within NCES to assist them with any difficulties they encounter in using NCES information. Users have mixed emotions about calling a centralized toll free telephone center unless it were manned by experts who are extremely knowledgeable about the technical content of the products that NCES generates. A centralized contact via electronic mail on the bulletin board system is projected to alleviate

some of the telephone transactions. However, some form of personal contact with NCES is desired by many of its major users.

Limited Support of Other Technologies

It is stated by experts that new technologies can take up to 30 years before full acceptance occurs. New technologies must battle user resistance, high equipment costs, and marketing obstacles. Therefore, regardless of the advanced dissemination technologies which NCES uses, it must also continue to support other more established technologies (9-track tapes) to serve its full user constituency. The time frame of support for older technologies may be limited by NCES as user demand wanes, however, the termination of support should be determined and announced to users well in advance of its occurrence. This gives users time to respond and upgrade equipment and methods appropriately. Trends from marketing information tracking distribution information will alert NCES to appropriate time frames for discontinuing support of any product vehicle.

Other Factors That Influence The NCES Dissemination Strategy

If NCES desires to be in the forefront of technical dissemination, then they should be committed to supporting their dissemination technologies. The development of an information dissemination strategy demands that attention be given to the level of support required to make the dissemination strategy a success. As part of this requirement analysis, it was determined that certain steps need to be taken to assure the success of newly developed NCES dissemination methods.

For developments to take place, and to move the user audience through the technology life cycle, NCES needs to promote its product offerings to create a level of awareness among the education information population. Promotion efforts will elevate awareness and change throughout the user groups with regard to the products that NCES has to offer.

Through these marketing activities, the NCES user community will become more aware of what NCES has to offer. Once the user community has been made aware of the latest products being made available to them, additional dissemination efforts is needed to make the user groups adapt the new technology. Users need to overcome their resistance to change and be made aware of the benefits and required procedures needed to implement each new technology.

Many factors influence a users choice in what technologies and products best serve their individual requirements for utilizing NCES data and information. The user population has varying degrees of informational requirements. In regard to implementing new technologies, a user's adaptation is a function of the following attributes:

1) Technical sophistication of the target audience;
2) Availability of funds to acquire equipment or services;
3) User friendliness of the technology;
4) Inclination or desire for the technology.

NCES can directly influence three of these four factors that affect the utilization of newly developed NCES products. The funding that is available to a certain individual user to purchase new equipment is obviously beyond the control of NCES. However, the other three factors are all directly associated with a learning process. If NCES provides opportunities for the education community to increase their

knowledge, than ultimately, this will lead to the advancement of the user audience along the technology learning curve.

This learning process within the user community is possible through certain marketing tactics. More specifically, these marketing activities include:

(1) Advertising, and
(2) User Training.

Through advertising and training, the user community will (1) become more aware of what is available from NCES, and (2) learn how to use the various products (in terms of both content and physical attributes that are associated with implementing a new statistical information technology). The purpose behind these activities is to develop a "transparency of solutions" and to create overall acceptance by the user community. The following subsections describe these activities and their impact on the user audience.

Advertising

Advertising involves letting the user audience know what is available from NCES.Advertising entails keeping the user community up-to-date on the latest studies being conducted, their availability dates, and reminders of recent releases. It is important for NCES to keep their user community informed. NCES should advertise in the educational journals and newsletters that are circulated among the education community. If NCES advertises in a routine, frequent manner, a certain level of awareness among the user community will be created. For example, NCES could place advertisements in traditional research media, such as American Education Research Association (AERA) journals that are distributed among the research community.

Advertising can also take place at the Regional Labs and Centers. These Labs and Centers provide the opportunity to increase the overall exposure and the level of awareness of NCES data and information. Advertising at this level will promote more widespread availability of NCES products. These Labs and Centers work to facilitate the use of NCES data and information. These organizations should continue their efforts in supporting the use of NCES data and information.

Advertising can also be used to act as a reminder to the user community. Small notices placed in newsletters, bulletins and newspapers aimed at targeted audiences will create awareness among the education community. Lists of what is available and release dates can be made available through mailing list efforts, ERIC, or made available on the fax system. By providing current information, and advertising where this information can be found, there will be a certain routine generated that will keep the user audience informed.

To generate interest in NCES available studies, new releases should be supported with the use of news conferences and press releases. NCES should make an effort to support the importance of these studies and the availability of them to their user audiences. Through press releases interest will be created and the general user audience will be given greater opportunity to be better informed.

Training

Training efforts are vital to driving forward user capabilities and technical sophistication levels along the evolution of statistical dissemination technologies.For new technological advancements to be accepted, the user audience needs to be trained as to (1) how to use the technology, (2) what equipment is required to utilize the dissemination vehicle, and (3) make the entire product "less scary to use".

NCES should sponsor seminars and work shops to support the recommended technologies to the user audiences. These NCES sponsored activities should focus on what studies are available, the product forms that they are available on, and how to use the product. Special work-shops performed for specific audiences must be well advertised to create enthusiasm and an interest to participate.

These work-shops will only be as successful as the products they are promoting. The products that are created by NCES should be evaluated to determine the overall ease of user interaction. The documentation on the technologies must be clear on the different technologies available. This documentation should be understandable and should create a "user friendly" product. Once the user community is shown how to utilize the new technologies, the level of resistance to move to the replacement technology should be minimized.

If the user audience is made to feel comfortable with using an alternative method of receiving NCES data and information, and is shown the benefits associated with implementing the new technology, users will progress along the technology life cycle. By NCES providing data and information in various dissemination vehicles, with differing levels of technical difficulty, they are allowing for change among their user audiences. These various dissemination technologies must be continually monitored in order to assess the usefulness of the product to the NCES user community.

Monitoring and Evaluating Information Dissemination Vehicles

A successful mix of dissemination technologies demands regular monitoring of the distribution of NCES data and information.Regular monitoring of the distribution of information dissemination vehicles will show the amount and frequency of demand for each transmission mode by product. This type of tracking is essential to the effectiveness of any dissemination program. Without this type of evaluative information, no modifications or corrections of the mix of information dissemination strategy can be made. The provision of this type of information is inherent in some vehicles. For example, the reporting system of the bulletin board system will record its use automatically. Likewise, order requests for CD-ROMs, diskettes, or data tapes will provide this information.

This type of monitoring should be designed at the onset of the introduction of a dissemination program. The time frame of review should remain quarterly at minimum. More frequent review should occur in the event of new promotion campaigns, or the introduction of other variables influencing dissemination. Although the data should be reviewed frequently, changes to the dissemination strategy should not be made prematurely. Before dispelling any technique an adequate time frame should be allotted to establish trends.

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